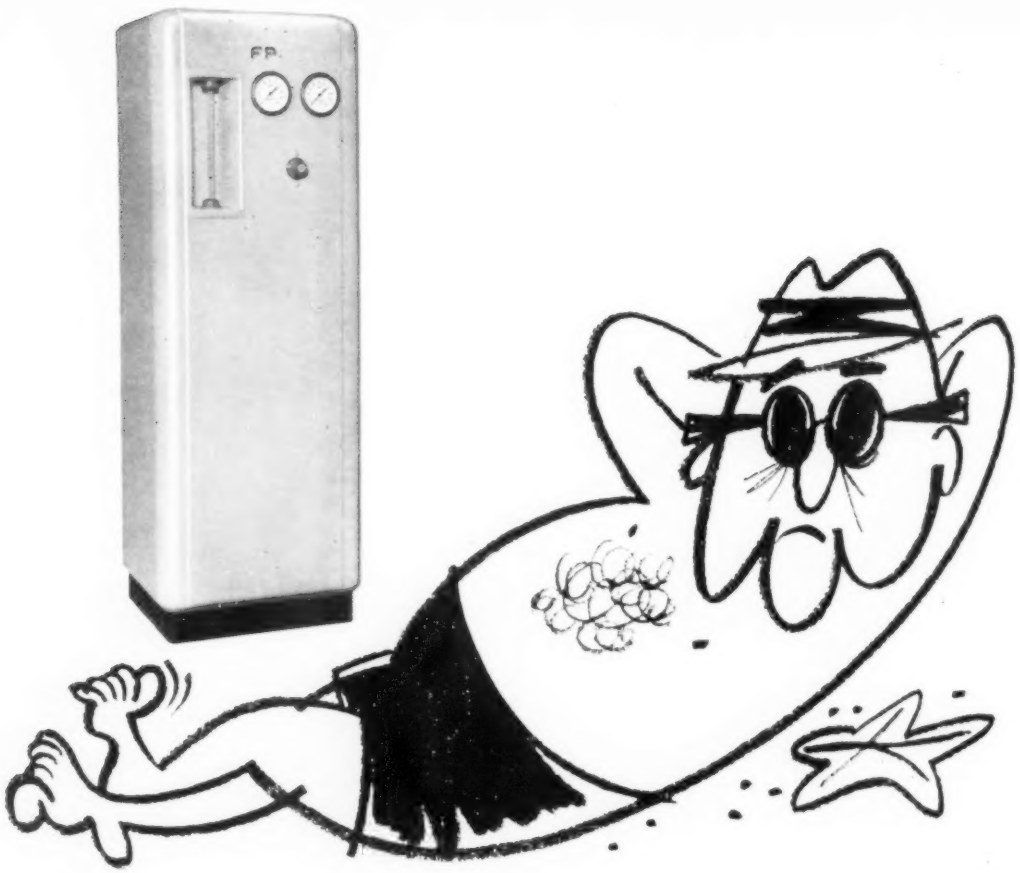
PUBLIC WORKS

June 1958

CITY, COUNTY AND STATE

Dewo T. Mitchell has been Sanitary Engineer of Franklin County, Ohio, since 1948. He is responsible, within the County, for sewerage, sewage treatment, water supply and refuse disposal. More details on page 18.



Technological unemployment they calls it...

It's a terrible thing to be put out of business by a machine. Used to be I was the hottest chlorinator fixer in the country. Travelled up and down the coast from job to job. And the pay was better than good.

OH! the fun I had till Fischer & Porter walked in with that new chlorinator! What with all kinds of special materials and fancy diaphragm regulators it hardly ever needed fixing at all.*

Still, I figured it would be twenty years before anybody would take a chance on such new-fangled tomfoolery. Why it didn't even *look* like a chlorinator!

Next thing I knew, those Fischer & Porter Chlorinators were springing up like so many mushrooms. And where one of them appeared, seems like *two* of the old-fashioned kind were cashiered out. Still it took five years for me to see the handwriting on the wall and retire.

• • •

Now, a word to the wise is supposed to be sufficient. If you'd rather not be dependent on chlorinator repairs, why not get the facts on new-fashioned chlorinators from Fischer & Porter Co., 568 Fischer Road, Hatboro, Pennsylvania.

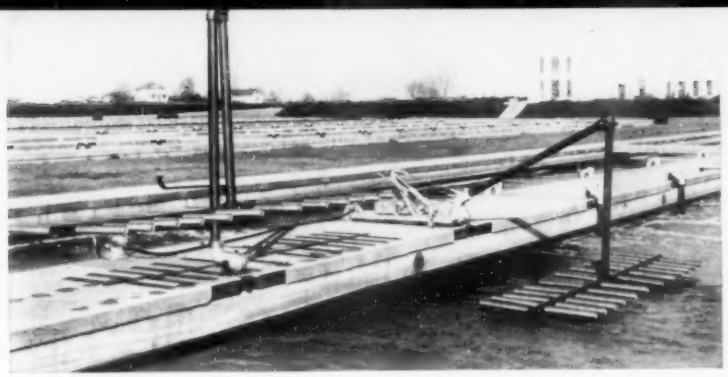
FP FISCHER & PORTER CO.

Instrumentation and Chlorination

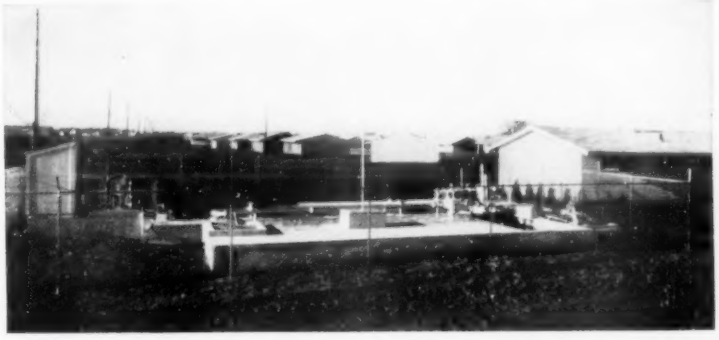
*Any wonder everyone's *trying* to copy F&P's design now?

"from Chicago"

Exclusively Successful Sewage Treatment Equipment

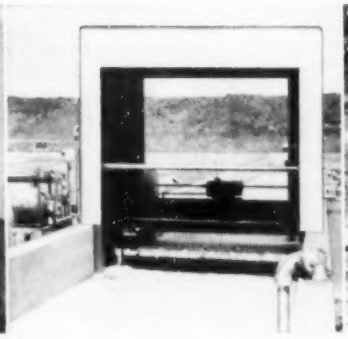


SWING DIFFUSER* Aeration Equipment—with Wide Band Aeration—easy accessibility, uninterrupted performance, economical operation. More than 700 installations.

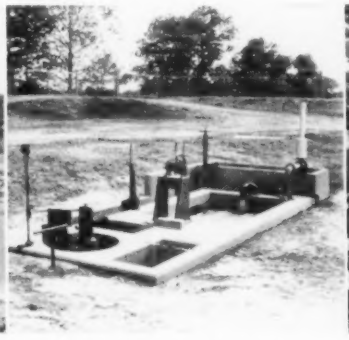


RATED A ERATION* Small Unit Sewage Treatment Process Equipment for 20 to 5,000 people . . . odor free, nuisance free, low cost. More than 250 installations.

FLUSH-KLEEN® Sewage Pumps — never clog! Solids never reach the impeller. More than 12,000 installations.



BARMINUTOR® Comminuting Machine — continuous screening and subsurface cutting of sewage solids. More than 200 installations.



AER-DEGRITTER* Aerated Grit Removal System — provides simultaneous grit washing and concentration. More than 175 installations.

CRP* The Accelerated Sludge Digestion System for unparalleled savings. 18 systems in successful operation, 11 more on order.

In addition, Chicago Pump Company Manufactures

SCRU-PELLER® Pumps

STANDARDAIRE* Blowers

"Chicago" Pontoon Covers

COMMINUTOR* Comminuting Machines

UT* Lift Stations

Chicago Pump Company offers a complete line of Sewage Treatment Equipment capable of solving any sewage problem.

Consulting Engineers are invited to request specific data direct or by contacting Distributors located in most principal cities.

Putting Ideas to Work

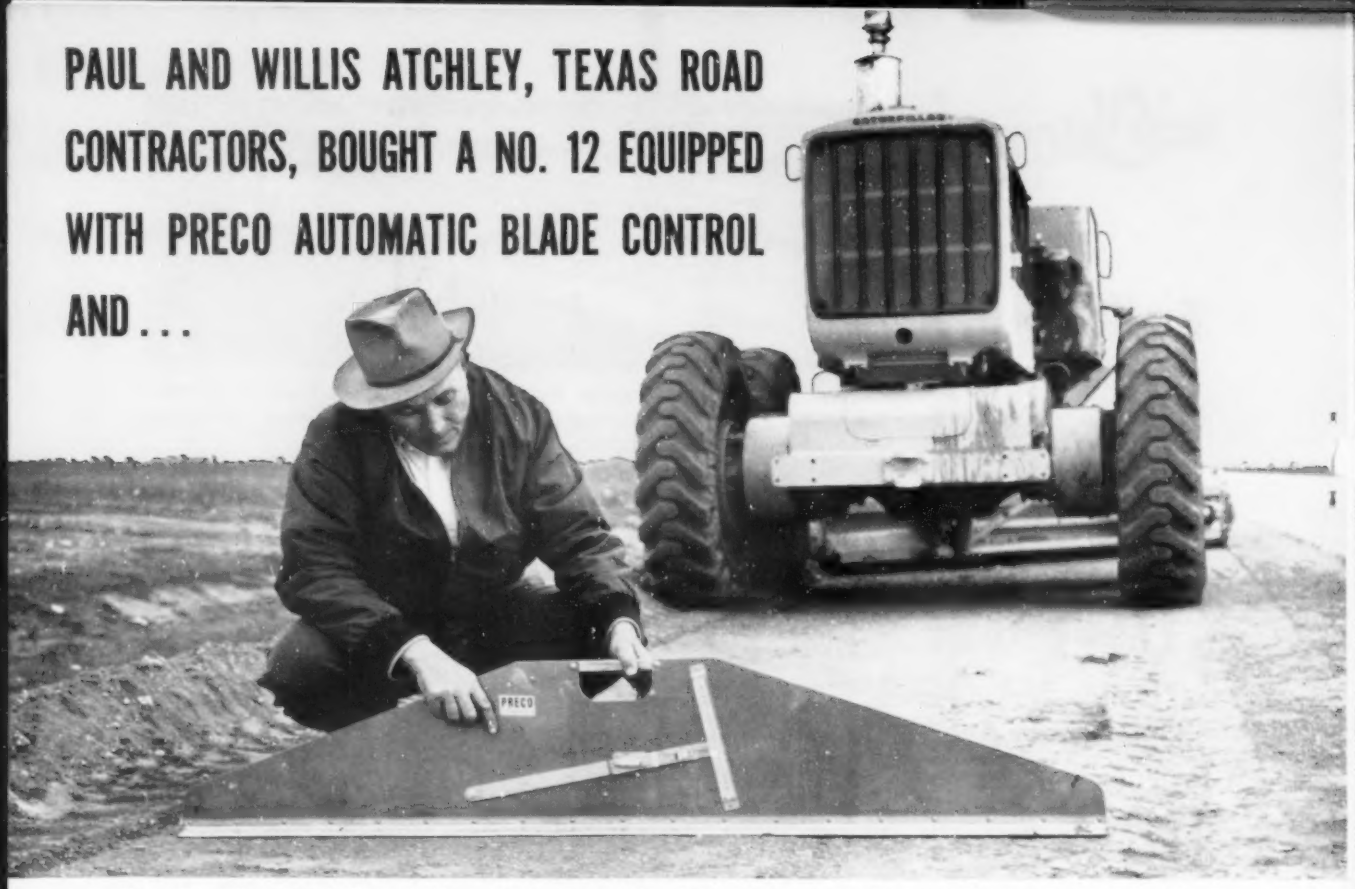
FOOD MACHINERY AND CHEMICAL CORPORATION

Chicago Pump Company

622 DIVERSEY PARKWAY · CHICAGO 14, ILLINOIS

*A trademark of Chicago Pump Company

PAUL AND WILLIS ATCHLEY, TEXAS ROAD CONTRACTORS, BOUGHT A NO. 12 EQUIPPED WITH PRECO AUTOMATIC BLADE CONTROL AND . . .



Using Preco Slope Board, W. A. Atchley confirms accuracy of grade, found to average within 3/100 of a foot on a 14-foot width.

DOUBLED PRODUCTION

"The work done by a Caterpillar No. 12 Motor Grader equipped with Preco Automatic Blade Control can be equivalent to that done by two motor graders. On this job, calling for a 14-foot shoulder on each side of a 16.3-mile stretch of U.S. 83, we are shaping 2,000 feet of road per hour."

CUT BLADING COSTS 33%

"We have found that the Preco Automatic Blade Control on a No. 12 will save 33% on blading costs in shaping subgrade and base material. On one 4,400-foot section, we cut subgrade and did approximately 35 yards to the station in roadway excavation in 8 hours. We then went back and shaped 3,000 feet for blade finishing base material in two more hours."

INCREASED ACCURACY

"On another job, we had to contend with a 14-inch parabolic drop on a 20-foot width. When we finished this section, using our Preco Automatic Blade Control, you could dust the blue top with your handkerchief. This convinced us of its accuracy. The Texas Highway Department checked behind the blade and found that we were, on the average, within 3/100 of a foot on a 14-foot width."

SERVICE...THE BEST

"Our recommendation to anyone buying equipment is to buy Caterpillar machines. Parts availability from the dealer has been good, and the service is on a par with the best I have ever seen."

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

FIND YOUR CATERPILLAR DEALER IN THE YELLOW PAGES

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

CUT GRADING COSTS WITH NO. 12-PRECO AUTOMATIC BLADE CONTROL

• • • SERVING THE PUBLIC WORKS INDUSTRY • • •

PUBLIC WORKS DIGESTS

DEPARTMENTS AND SECTIONS

Public Works T. M. Reg. U.S. Pat. Off.
Established 1896

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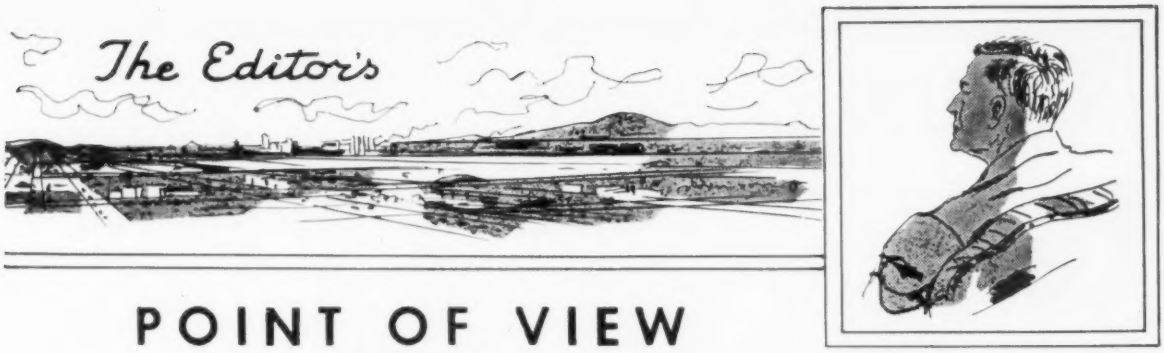
BPA

JUNE 1958

PUBLIC WORKS

Vol. 89, No. 6



POINT OF VIEW

Buy Equipment Now and Your Money Performs A Double Service

BY BUYING maintenance and construction equipment now, cities, counties and states can get double benefits from their money. Scarcely any governmental agency has the modern machinery it needs—tractors, trucks, graders, loaders, mowers and a host of other cost saving tools. Government at all levels has been woefully slow to adopt and to use fully the most up-to-date equipment.

The primary purpose in buying now is that this new equipment does work at a lower cost, faster and better. Cities, counties and states can serve their citizens better, and at a lower overall cost because today's tools work for less and do more work.

A second purpose is that, in thus helping themselves, our governmental agencies can and will contribute much to the national welfare by buying now. Moreover, there have been few, if any, times on record when so much can be gotten for the dollar. Today, many items of equipment can be bought at advantageous prices and better than ever allowances can be obtained on outmoded and worn equipment.

Buying now will help everyone, most of all the buyer. Tax-conscious citizens will applaud such a move and will be increasingly apt to criticize its delay or absence.

Some Needed and Useful Inventions

AMONG THE THINGS needed in the Public Works field, not now available, is a snow plow that will not block every driveway with a big pile of snow. It ought to be possible to put a controlled tip on the right end of the blade so that the operator could push the snow past a driveway instead of into it. After passing the driveway, the blade tip could be retracted for normal plowing. This would improve dispositions, reduce complaints and lower the heart attack rate.

There are other inventions that would be useful. One needed one is a fertilizer, usable in public parks, on private lawns and on the grassy strips along sidewalks, which would repel dogs as well as produce a good sward. While we are about it, we might as well point out also the possible great sales of space satellites for garbage disposal. There is lots of outer space; all we need is some way to get garbage there, solving one of our big problems.

For the information of our readers, none of our staff suffered heart attacks from shoveling snow last winter. Our refuse collection and disposal service is pretty good; and the less said about the dog problem the better.

Making Sanitary Landfills Sanitary

MANY COMMUNITIES are operating landfills that do not measure up to any reasonable standard of sanitation. Some of them, in fact, are no more than the old familiar dump with a sprinkling of dirt over the accumulations. The refuse is not compacted adequately and is not covered properly at the end of the day. These are the two basic considerations in landfill.

Good operation requires proper equipment. This must be heavy enough to compact both refuse and soil properly and rugged enough to withstand heavy work. Purchasing light equipment can be a costly mistake as experiments reported in this magazine a few months ago indicate. Regulation of the disposal area, with dumping of materials at such hours as to permit proper compaction and cover before night, is another essential. Perhaps most important of all is proper instruction of the operator and supervision to insure that he is doing his job correctly. Getting a good sanitary landfill is not difficult but it does require observance of certain fundamental considerations.

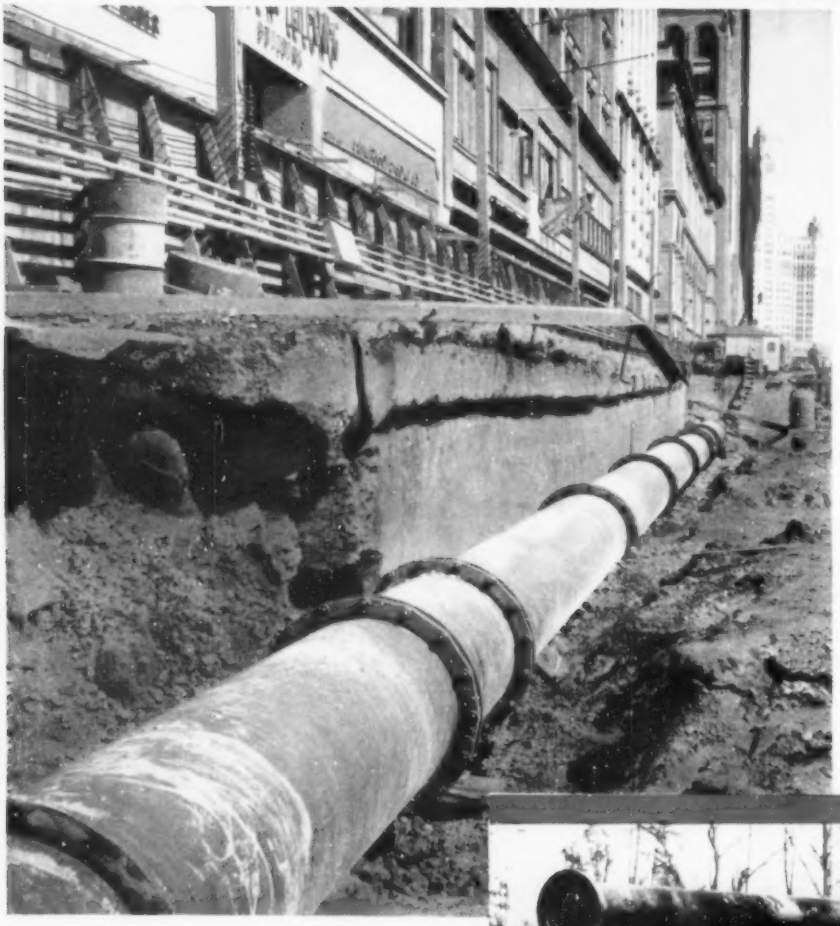
A Welcome to our 1958 Engineering Graduates

THIS IS A month when many young men, after four years of technical training, will enter into active engineering work. We welcome and congratulate them. They are in an interesting and rewarding profession which demands much but gives more in return.

Public works engineering is one of the finest fields that young engineers can enter. The backlog of work to be done—our tremendous highway program, the provision of water for our people and the disposal of wastes—represents a challenge to engineers who alone can solve the problems inherent in design, in construction, in maintenance and in operation. And our growing population will present new problems before our current ones are solved.

There is opportunity here for many talents—research, design, construction, administration and management. All are needed and all are welcome.

WHATEVER THE SITE



Chicago, Ill.—Installing 24" Mechanical Joint cast iron pipe for water line rerouted due to construction of underground garage beneath Michigan Avenue.

Hickory, N. C.—High beam strength of Cast Iron Pipe makes it particularly adaptable to this type of construction on outfall sewer.

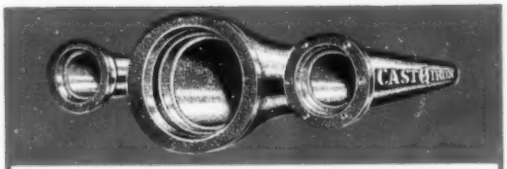
MODERNIZED cast iron

OR SITUATION...

there's a Cast Iron Pipe for the job

WHAT'S YOUR PROBLEM?

let us help you solve it...



6 reasons

why Cast Iron Pipe

is #1 choice of U. S. A.

1. HIGH FLOW CAPACITY...
   Cement lined cast iron pipe and fittings will not tuberculate . . . delivers a full flow for the life of the pipe.
2. LONG LIFE...
   42 North American cities are still using cast iron water mains laid 100 years and more ago. Hundreds more have passed the 50 year mark.
3. BEAM STRENGTH...
   Cast Iron Pipe is inherently tough . . . stands up under heavy traffic load, soil displacement and disturbance.
4. EXTERNAL LOAD RESISTANCE...
   6" Class 150 Pipe withstands a crushing load of 17,900 pounds per foot . . . nearly 9 tons.
5. CORROSION RESISTANCE...
   Cast Iron Pipe effectively resists corrosion . . . vital factor in its long life and dependability.
6. TIGHT JOINTS...
   A full range of leak-proof, low cost, easy-to-assemble joints for pipe and fittings are available for all conditions.

No telling where you may need to lay pipe . . .

Hilly country or flat, city street or rural lane, under superhighways, railroads or rivers.

But whatever the site or situation you *can* be sure of this: with cast iron pipe properly installed there'll be no trouble on or after the job.

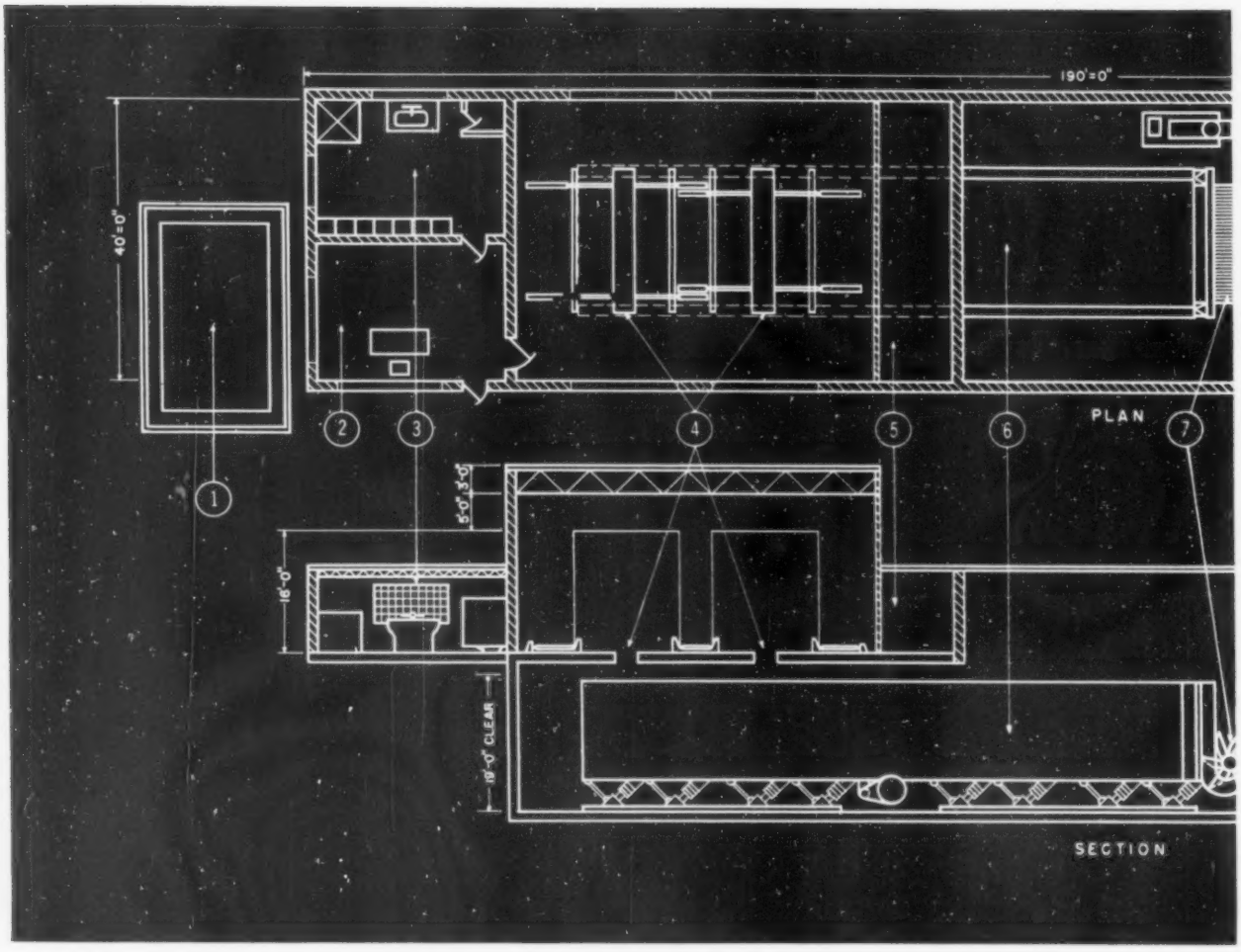
Dependability, long life are built into every rugged length of cast iron pipe. Dependability *proved*, not merely promised.

THE MAN WHO CHOOSES
CAST IRON PIPE TODAY
WON'T PAY FOR IT AGAIN
TOMORROW!

®
CAST IRON

Cast Iron Pipe Research Association
Thos. F. Wolfe, Managing Director
Suite 3440, Prudential Plaza, Chicago 1, Ill.

pipe FOR MODERN WATER WORKS



for low-cost incineration

DRAVO INCINERATORS COST LESS TO BUILD

The Dravo Continuous Flow Incinerator is designed to make use of developments in materials handling, combustion and air pollution control that meet two considerations: One—add to efficiency of the operation, Two—be economical in first cost and contribute to low operating and maintenance costs.

As a result, this type of installation can be built for **two-thirds the cost of other equivalent facilities.** Here are two of the construction design principles that contribute materially to this low cost:

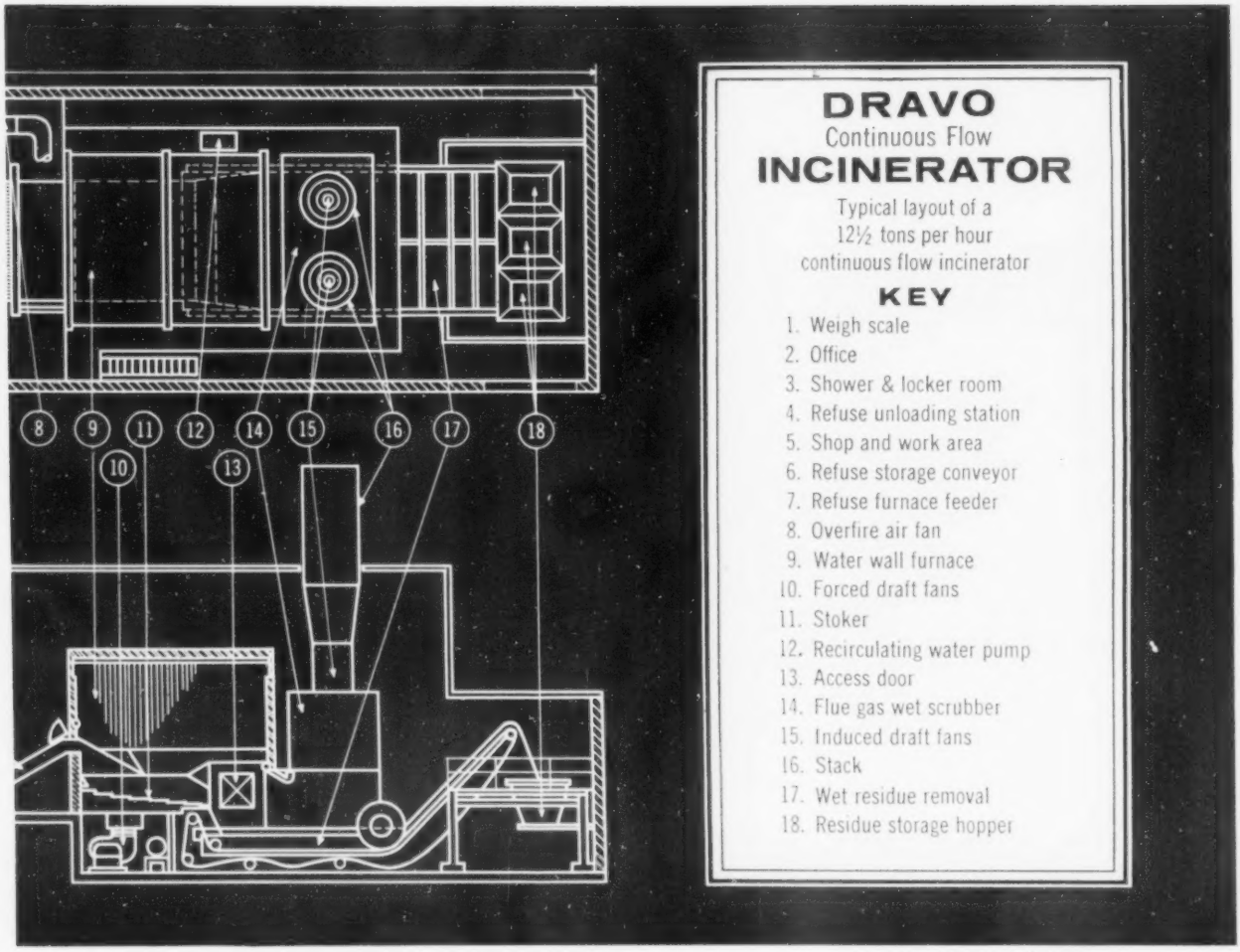
1. The Continuous Flow Principle. The use of a storage-type conveyor permits direct unloading of refuse trucks. This system avoids the expense of separate storage facilities and the accompanying unloading and handling facilities.

2. The Water-Wall Furnace Principle. The water-wall furnace eliminates use of thick, expensive refractory walls. In many installations, waste heat can be recovered in the form of hot water or steam.

The Dravo Incinerator provides high temperature combustion, which, with the wet scrubber system, assures the absence of fumes and fly-ash. A plant may therefore be built in heavily populated areas. The lower construction cost inherent in this design makes incineration economically feasible for any community.

DRAVO

Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging
fabricated piping • foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges



DRAVO
Continuous Flow
INCINERATOR

Typical layout of a
12½ tons per hour
continuous flow incinerator

KEY

1. Weigh scale
2. Office
3. Shower & locker room
4. Refuse unloading station
5. Shop and work area
6. Refuse storage conveyor
7. Refuse furnace feeder
8. Overfire air fan
9. Water wall furnace
10. Forced draft fans
11. Stoker
12. Recirculating water pump
13. Access door
14. Flue gas wet scrubber
15. Induced draft fans
16. Stack
17. Wet residue removal
18. Residue storage hopper

of municipal refuse . . .

DRAVO INCINERATORS COST LESS TO OPERATE

One of the basic principles on which design of the Dravo Incinerator is based is Continuous Flow. This is more than simply a conveying system, since it is designed to move refuse from the unloading end to residue storage with minimum operator attention. Flow is automatic, allowing a comparatively small staff to operate the facility. Drive-through unloading arrangement assures maximum use of trucks.

Collection costs are lower, too. Refuse does not have to be separated and cleanliness of the plant permits central location where haulage distance can be shortened. Here are a few of the features which provide economical operation:

- No storage pits—no cranes or crane operators.
- No waiting to unload trucks, no need for backing or turning areas.
- No massive refractory wall furnaces—no extensive shut downs for relining of furnace walls.
- Complete combustion of all burnable refuse means less residue.
- Automatic operation of Continuous Flow system reduces operating personnel.

Low-cost construction and low-cost operation are the keys to a really efficient municipal refuse disposal system. Our engineers will be glad to work with you in developing the most economical solution to your particular problem. Write Dravo Corporation, Dravo Building, Pittsburgh 22, Pa.

process equipment • pumphouses and intakes • river sand and gravel • sintering plants
slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

DRAVO
CORPORATION

Exclusive all-phase sanitary landfill efficiency!

—for Burlington, No. Car. (Pop. 30,000)

Clamshell action enables picking up and spot-placing bulky refuse, without disturbing already compacted material. Even such hard-to-handle cast-offs as old tires or tree-stumps are easily handled with this 4-In-1 "clam" action.

"Carry-type scraper" action provides the exclusive, easily-controlled means of spreading "cover" evenly over the layered refuse—on the go. You simply regulate the amount of earth placed by controlling the clam lip opening.

Skid-Shovel action of the 4-In-1 lets you "iron down" the cover using the load-weighted bucket—plus hydraulic down-pressure of the compactor plate. This produces the positive compaction to eliminate rat-havens, "mosquito hatcheries," and stench pockets!

Your city can have up to double the efficiency of ordinary land-fill equipment—with an International Drott 4-In-1 or Bullclam. See how much extra utility, too, the 4-In-1 will give on street and park duties, and producing sand, gravel, or rock! Ask your International Drott Distributor for a 4-In-1 demonstration.

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL® DROTT®

Bulldozer action permits spreading refuse in uniform layers—for easy compaction and thorough covering. With clam lip up and skid-shoes on the ground, the International Drott 4-In-1 is positioned for big-capacity refuse blading. These four TD-14 4-In-1 landfill scenes show how Burlington, North Carolina, handles refuse disposal for its 30,000 citizens. Daily collections total 400 cubic yards of packed rubbish and garbage.

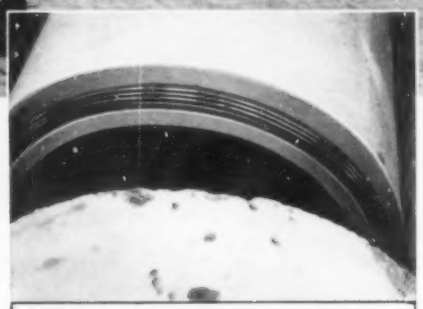
"Our 4-In-1's versatility is adaptable to every phase of sanitary landfill operation, assuring fill compaction and coverage of refuse," states Richard F. Moore, Burlington's Supt. of Sanitation.

Versatility unlimited...all over town!

Part time on the sanitary fill—part time on streets, drives, parks, and playgrounds—that's the routine for many city-owned International Drott 4-In-1's. This TD-14 4-In-1 is removing old street surfacing materials. Other popular city jobs for 4-In-1's are loading sand and gravel, installing culverts and landscaping!

With up to twice the refuse-handling capacity of "single-action," limited-duty rigs, International Drott Bullclams provide amazing efficiency and economy. Bullclams are recommended for the larger cities needing the full-time service of a specialized, big-capacity refuse disposal machine. The TD-18 Bullclam shown is using compactor plate action to pack and seal refuse on a Fort Worth, Texas, landfill!

IN TORONTO, ONTARIO *



TYLOX seals by compression — can't leak when properly installed.

TYLOX
Rubber
PIPE GASKETS

speed construction, reduce cost and increase efficiency of new sewage treatment plant

When engineers and city officials chose TYLOX Rubber Gaskets for coupling pipe in the large new Humber Sewage Treatment Plant, they assured citizens of Toronto *most* for their waste disposal dollar in three important ways . . . Here's how:

• **TYLOX PREVENTS LEAKS** — Multiple sealing ribs of flexible TYLOX Gaskets seal pipe joints tight by *compression*. Water can't leak in or out. Infiltration loads are minimized. Root and sediment problems are eliminated. Sewage plants operate more efficiently, at less maintenance cost.

• **TYLOX SPEEDS PIPE-LAYING** — TYLOX Gaskets "snap on" to the pipe tongue in seconds. Merely shoving the pipe home completes the joint. Flexible TYLOX compensates for pipe angularities, mud and water don't slow up the work, and laid line can be backfilled as fast as pipe is coupled. Construction costs are substantially reduced.

• **TYLOX NEVER DETERIORATES** — TYLOX rubber is specially compounded to resist sewerage and industrial waste acids and alkalies. Under ground and under compression, it outlasts the pipe itself and *never* loses its resilience.

WRITE FOR TYLOX BROCHURE

If you are not already a TYLOX user, get the engineering data and illustrated case histories showing why TYLOX installs faster, seals tighter and lasts longer than any other pipe gasket.

* **PROJECT:** Humber Sewage Treatment Plant, for Municipality of Metropolitan Toronto, Ross L. Clark, Commissioner of Works.

ENGINEERS: James F. MacLaren Associates, Toronto, Ont., and Alvord, Burdick & Howson, Chicago, Ill.

CONTRACTORS: Pigott Construction Co., Ltd., and Universal Plumbing & Heating Co. Ltd., Toronto, Ontario.

PIPE: Niagara Concrete Pipe, Ltd., St. Catherines, Ontario, Canada.

HAMILTON KENT MANUFACTURING COMPANY

KENT, OHIO

427 West Grant Street **Orchard 3-9555**

CANADIAN PLANT: 10 BRUSSELS ST., NEW TORONTO, ONT., Phone CLifford 1-2494

5091

Non-Reflectorized Pavement Markings . . .

HOW MANY LIVES WILL THEY COST TONIGHT?

The cost of reflectorizing pavement markings is extremely low . . . when you consider the lives that may be lost without it.

It is our firm belief that any stripe worth laying is worth reflectorizing. A great many traffic engineers hold this same view . . . and use Cataphote Reflective Traffic Beads to accomplish this purpose. Their records of reduced nighttime traffic fatalities . . . their records of longer marking life . . . prove it has been a wise investment.

If you'd like more information on Cataphote Reflective Traffic Beads . . . what you can do with them . . . what they can do for you . . . write today.

Cataphote
CORPORATION
TOLEDO 10, OHIO / JACKSON, MISSISSIPPI

Manufacturers of CATAPHOTE REFLECTIVE BEADS • CATAFLEX REFLECTIVE COATING • CATALINE REFLECTIVE STRIPING
CATATHERM REFLECTIVE PLASTIC STRIPING • TRAFFIC SIGNS • STREET NAME SIGNS

For a real picnic, treat them to Peladow

Dow high-test calcium chloride keeps unpaved roads dust free at lower cost

The easier, faster, cleaner, cheaper way to treat unpaved roads is with Peladow®. Clean, white as snow, Peladow lays dust like a wetted blanket and resists being tracked about or kicked off a road. Reduces gravel loss as much as 80%, blading costs as much as 85%. Can be applied dry or in a water solution.

its pellet form is especially designed for bulk use, for free flow and fast even spreading. You can load Peladow directly from hopper car to trucks. (Equipment required is simple, inexpensive, easy to acquire.)

And due to its high concentration, 94-97%, four loads do the work of five flake type calcium chloride. Peladow saves time, labor, shipping, storage and handling costs . . . is available from our Ludington, Michigan, plant in bulk hopper cars, bulk tank cars, bulk trucks, as well as 80-lb. bags.

For further information on Peladow (or Dowflake®—our 77-80% calcium chloride flake) and for application assistance and recommendations, write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. CC 7141I-1.

YOU CAN DEPEND ON DOW

what's it worth to have visibility?

DAVIS LOADER-BACKHOE

lets you see your way for MORE CLEAR PROFIT!

DIGS OUT OF TIGHT SITUATIONS! No other backhoe can move in and operate as close to buildings, fences, and other obstructions as the Davis. It even will dig flush footings.

The Davis Model 210 Backhoe has three interchangeable mounting locations — at either end or at the center of the frame. Does jobs no other backhoe can do!

You Work Faster – Because a Davis Loader-Backhoe rig has maximum visibility you eliminate guesswork and are more accurate in what you do. You can clearly see what needs to be done – and you can do it in record time.

You Do More Work with a Davis rig. Because it has versatility as well as visibility – including multiple quick change attachments for the loader and exclusive flush digging alongside buildings, fences, etc. by the backhoe – you are able to reduce hand labor costs and single-purpose equipment costs.

You Can See that the Davis Loader-Backhoe has quality and advanced engineering. This combination offers more money-making features than any other rig you can buy. Built-in stamina to stay on the job . . . superior hydraulics . . . positive controls and maneuverability are just a few.

Low, Competitive Prices – Despite the fact that Davis leads the field, you'll find the cost lower than most other rigs that can do just half the work.

Get in to see your Davis Dealer right away!

Davis Loaders and Backhoes are available for all popular models of International, Ford, Fordson Major, Ferguson, Case, Massey-Harris, Allis-Chalmers, Oliver, John Deere, Minneapolis-Moline, and Work Bull Tractors.

SOLD AND SERVICED EVERYWHERE BY BETTER DEALERS

Write for the name of your nearest dealers.
Please specify make of tractor.

MASSEY-FERGUSON INDUSTRIAL DIVISION

1009 S. WEST STREET • WICHITA 13N, KANSAS

Desso T. Mitchell has held the position of Sanitary Engineer, Franklin County, Ohio, since 1948. He is administrative head of the Sanitary Engineering Department and is responsible for the construction and operation of sanitary sewers, sewage treatment plants and water supply as well as garbage and refuse collection and disposal.

He was the first County Sanitary Engineer in the state to institute county wide garbage and refuse collection and disposal which service has been made a self sustaining operation through fees and service charges. He is at present serving as chairman of an ASCE Committee on preparation of a Manual of Practice on the Sanitary Landfill Method of Garbage and Refuse Disposal. Prior to accepting his present position he was employed 19 years in the Sewerage Department of the City of Columbus, becoming Engineer in charge. He served 3 years in the Sanitary Corps, U. S. Army, during World War II, half of which time was in the U. S. and half in the Pacific Theater. During 1949, he held a temporary appointment as Assistant Professor of Civil Engineering at The Ohio State University where he taught water supply and sewage treatment.

Mr. Mitchell attended Defiance College and graduated from The Ohio State University in Civil Engineering.

His hobbies are gardening and amateur dramatics, both shared by his wife; and the Kiwanis service organization. He is a member of ASCE and of the Columbus Engineers Club. He holds licenses as Professional Engineer and Surveyor and was recently certified as a Sanitary Engineer by the ASEIB.

BE FAST WITH THE FACTS!

. . . Time is always money

When you are collecting data to get the job done right. Take advantage of the helpful information on proven methods, materials, services and equipment published by leading suppliers in their literature, and for data on the latest devices designed to help you in your work. Our Readers' Service Department is always ready to assist you in finding the quickest and most economical answer to your problems.

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Meetings and Conventions

Material Handling Exposition
Cleveland, Ohio, June 9-12

New Jersey Section, AWWA
Somerville, N. J., June 10

National Society of Professional Engineers
St. Louis, Mo., June 11-14

Maryland-Delaware Section, FS&IWA
Frederick, Md., June 12-13

Western Area Spring Conference, APWA
San Diego, Calif., June 15-18

Ohio Section, FS&IWA
Toledo, Ohio, June 18-20

Iowa Section, FS&IWA
Council Bluffs, Iowa, June 18-20

American Society for Testing Materials
Boston, Mass., June 22-27

Michigan Section, FS&IWA
Charlevoix, Mich., June 23-25

Pennsylvania Section, AWWA
Erie, Pa., June 25-27

School for Highway Superintendents
Cornell University, Ithaca, N. Y., June 30-July 2

Short Course — "Introduction to Computer Methods for Highway and Traffic Engineers"
Yale University, New Haven, Conn., July 7-19

Pennsylvania Section, FS&IWA
University Park, Pa., August 13-15

Michigan Section, AWWA
Grand Rapids, Mich., Sept. 8-10

New York Section, AWWA
Lake Placid, N. Y., Sept. 10-12

Georgia Section, FS&IWA
Atlanta, Ga., Sept. 10-12

New England Water Works Association
Poland Spring, Maine, Sept. 14-17

International Congress on Large Dams
New York, N. Y., Sept. 15-20

Rocky Mountain Section, AWWA
Denver, Colo., Sept. 15-17

Ohio Section, AWWA
Cleveland, Ohio, Sept. 17-19

Wisconsin Section, AWWA
Wausau, Wis., Sept. 17-19

South Dakota Water and Sewage Works Conference
Deadwood, S. Dak., Sept. 17-19

Public Works Congress & Equipment Show, APWA
Kansas City, Mo., Sept. 28-Oct. 1

National Institute of Governmental Purchasing, Inc.
Boston, Mass., Oct. 5-8

Federation of Sewage & Industrial Wastes Ass'n.
Detroit, Mich., Oct. 5-9

California Section, AWWA
Los Angeles, Calif., Oct. 28-31

6-58

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READERS' SERVICE DEPT.

PUBLIC WORKS Publications

200 SOUTH BROAD STREET

RIDGEWOOD, N. J.

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READER SERVICE is a monthly feature of PUBLIC WORKS Magazine designed to help the reader get all the information needed with the minimum of time and effort. Mail your card today!

This distillery was caught in a squeeze

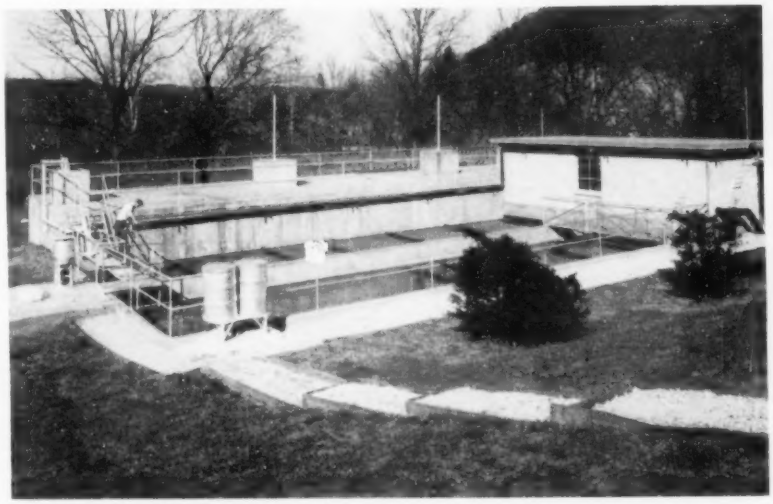
between the need to prevent stream pollution

and the absence of municipal sewage facilities.

Solution: a LINK-BELT Bio-Filtration plant providing . . .

pollution control — pure and simple

Like many another plant which has located at an outlying site, National Distillers Products Company (Frankfort, Ky.) found it necessary to treat its own process and sewage wastes. Because the only outlet is a nearby stream of insufficient waste absorption capacity, it was found essential to treat the wastes in order to avoid any stream pollution hazard. And the solution—a highly effective one — was found in a simple Link-Belt bio-filtration system.



BIO-FILTRATION PLANT is Link-Belt's answer to National Distillers' stream pollution problem. Link-Belt primary and secondary Straightline sludge collectors and Straightline scum breaker assure thorough solids removal. A similar system was furnished by Link-Belt in 1949 for another National Distillers plant.

Pattern for Pollution Control

In taking on any problem of this nature, the first move is to determine the nature of the wastes . . . the ability of the stream to dilute, purify and carry them away safely. A modern, well-equipped Link-Belt laboratory is maintained to assist your engineers.

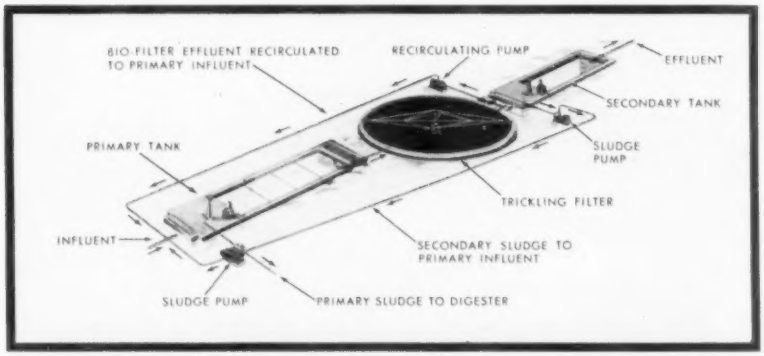
Next step: a study of the processes from which the wastes originate in order to check or reduce the pollution at its source. As a result, it is often possible to reduce the cost of treatment facilities necessary by segregating polluting wastes from non-troublesome discharge.

Armed with this complete data, Link-Belt is able to make an accurate and unbiased recommendation. Whatever treatment equipment is indicated —screens, mixers, collectors, conveyors, drives—there's an economical answer in the broad Link-Belt line.

Experienced Source

Link-Belt invites the opportunity of working with your own engineers, chemists and consultants in planning a waste treatment system for your plant. A background of over 35 years in sanitary engineering includes not only industrial wastes, but large municipal water and sewage treatment plants as well. Whether your chief concern is the reduction of pollution, recirculation of process water or the recovery of salable by-products — you can be sure of a system tailored to your exact needs, operating at lowest cost, and built to last. Your nearest Link-Belt office can give you full details on Link-Belt equipment.

You'll also be interested in our 20-minute color-sound film, "Pure and Simple"—lent on request for viewing by your group.



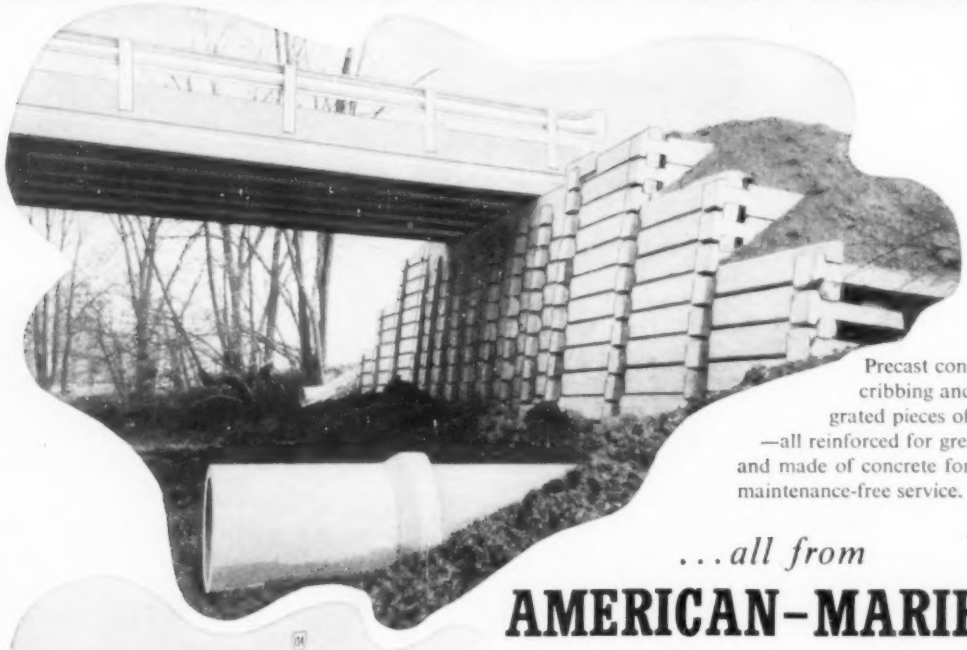
TYPICAL LINK-BELT SINGLE-STAGE BIO-FILTRATION PLANT—similar to the system at National Distillers—consists of primary settling, biological trickling filter and secondary settling. The filter acts as the source of oxygen for micro-organisms and the settling tanks serve for coagulation as well as settling.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. Sanitary Engineering Regional Offices—Colmar, Pa., Chicago 9, Kansas City 8, Mo., San Francisco 24. Sales Offices in All Principal Cities. Export Office, New York 7. Representatives Throughout the World. 14,088

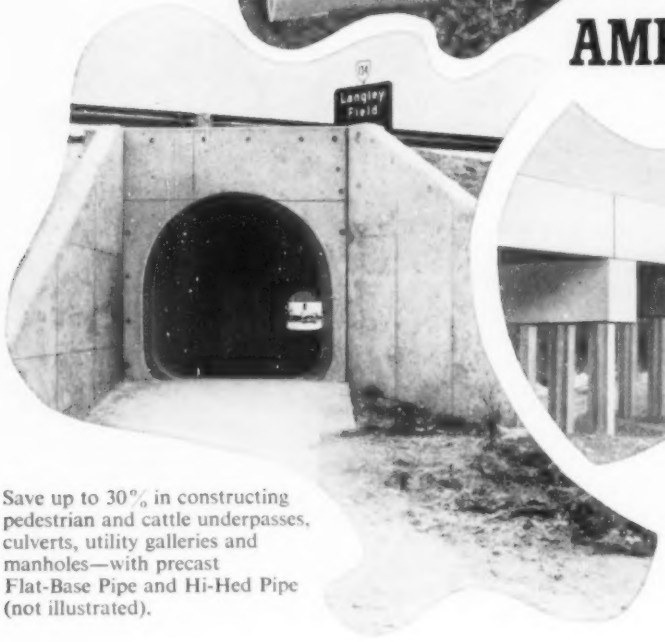
PRECAST PIECES TO FIT YOUR PUZZLE...



Precast concrete bridge, cribbing and pipe—integrated pieces of a single job —all reinforced for greater strength and made of concrete for permanent, maintenance-free service.

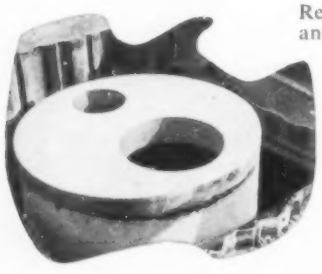
...all from

AMERICAN-MARIETTA



Save up to 30% in constructing pedestrian and cattle underpasses, culverts, utility galleries and manholes—with precast Flat-Base Pipe and Hi-Hed Pipe (not illustrated).

Save time by using American-Marietta precast reinforced piling and bridge slabs—ready for installation when you need them.



Reinforced concrete lift stations and other special structures, including manholes, septic tanks and wheel stops, readily available from A-M plants strategically located throughout the country.

Other examples of
PROGRESS IN
CONCRETE

AMERICAN-MARIETTA COMPANY
CONCRETE PRODUCTS DIVISION
GENERAL OFFICES:
AMERICAN-MARIETTA BUILDING
101 EAST ONTARIO STREET, CHICAGO 11, ILLINOIS, PHONE: WHITEHALL 4-5600

OLIVER

SUPER 88 HYDRO-TRENCHER

"We bought the Oliver after watching it perform for others"

"And there was only satisfaction in what we saw," says this owner of a Hydro-Trencher in Yonkers, N.Y.

And here's what some other owners have told us:

★ "The Hydro-Trencher does 25% more work than any comparable rig we have ever seen."

★ "It would take three men 6 or 8 hours to do what our Hydro-Trencher does in 30 minutes."

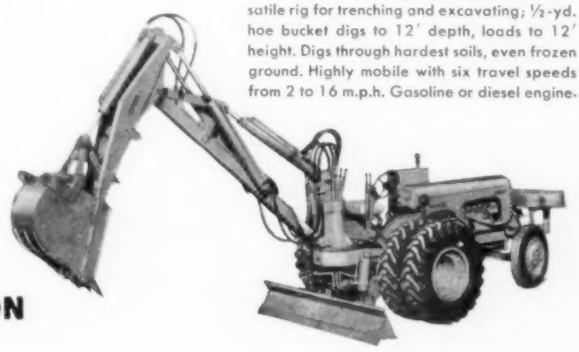
★ "Our Oliver has performed so well that 3 others in our area have bought Super 88 Hydro-Trenchers."

★ "In light or heavy work it can't be beat."

★ "After 2 years, maintenance has been negligible."

After all, when you're buying a back hoe, you're buying *performance*...the ability to dig faster, easier, at lower cost. So why not see for yourself?

Your Oliver distributor will gladly refer you to some owners of the Super 88 Hydro-Trencher in your area. Or ask for a demonstration. Let us prove that the Hydro-Trencher can outwork them all.



Oliver Super 88 Hydro-Trencher—a versatile rig for trenching and excavating; ½-yd. hoe bucket digs to 12′ depth, loads to 12′ height. Digs through hardest soils, even frozen ground. Highly mobile with six travel speeds from 2 to 16 m.p.h. Gasoline or diesel engine.

OLIVER **THE OLIVER CORPORATION**

Industrial Division, 19300 Euclid Ave., Cleveland 17, Ohio


IN
WASHINGTON
STATE...
OVERLAID FIR
DUPONT
FT. LEWIS
NEXT RIGHT
1/2 MILE
WASHINGTON STATE HIGHWAY DEPARTMENT
TRAFFIC ENGINEER: Rex G. Still
SIGN ENGINEER: Alan L. Solberg

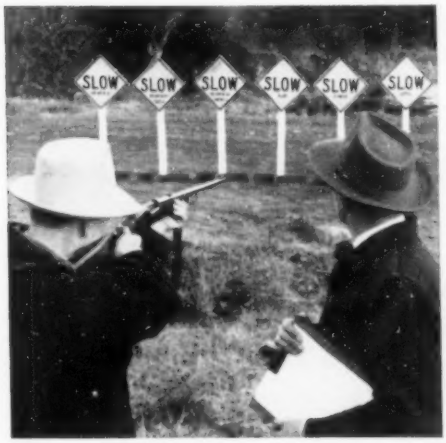
PLYWOOD SIGNS SHOW THE WAY

WASHINGTON STATE highway officials guide motorists with modern color-coded reflectorized signs of overlaid fir plywood. And because they cost less and last longer than metal signs, they mean important savings for taxpayers, too.

The state has standardized on High Density overlaid plywood for all large directional and informational signs. Reflective sheeting is applied direct, without prime coats. This elimination of painting saves money and the plastic-like high density overlay provides a better and more foolproof bond for the reflective sheeting. Backs are painted only where special colors are required.

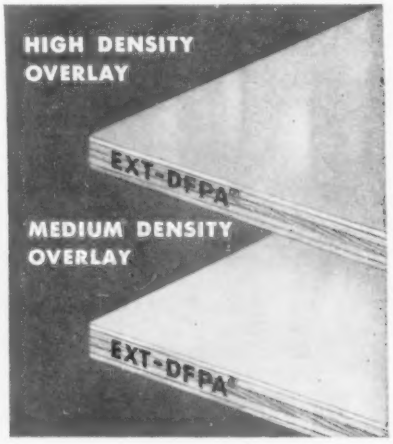
For smaller warning and regulatory signs, Washington uses both High and Medium Density overlays. In the case of Medium Density, panels are primed before reflectorizing.

Washington has found that overlaid plywood signs stand up better under severe weathering and accidental or deliberate abuse. There is no rust, corrosion or other progressive deterioration after damage. Plywood signs are stronger and stiffer, too, and require fewer posts and framing members. Panels are light and easy to handle.



Vandalism tests conducted by Douglas Fir Plywood Association show plywood signs far stronger and more durable than steel or aluminum. Bullet holes, for example, are clean, sharply defined, with limited impact area. Write for test report.

Strength and stiffness mean larger size (up to 4' x 8') plywood signs can be installed without backing or framing. On king-size shoulder mounted or overhead signs, supporting framework is greatly simplified. Panels are light, easy to handle.



Durable overlay eliminates checking, grain raise. High Density overlay needs no paint protection; reflective sheeting may be applied direct. Medium Density is for plain painted signs. Base panel is waterproof Exterior (EXT-DFPA) plywood.

FOR MORE INFORMATION (detailed specifications, application data, etc.) write to:

DOUGLAS FIR PLYWOOD ASSOCIATION
TACOMA 2, WASHINGTON

—a non-profit industry organization devoted to research, promotion and quality control

DFPA TESTED QUALITY

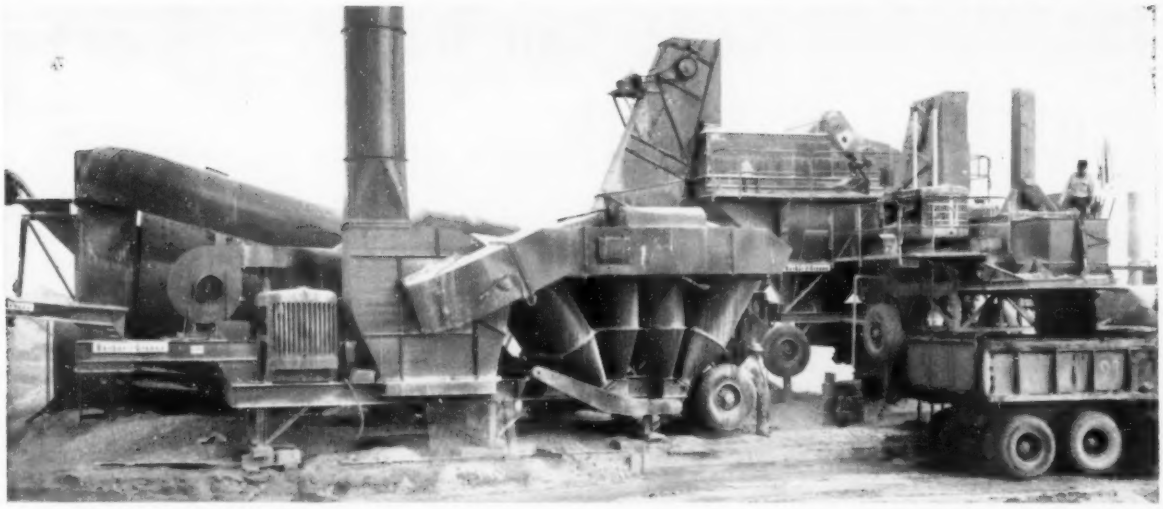
SANITARY ENGINEERING CERTIFICATION

Here are a few figures on the work that has been done so far in certifying sanitary engineers. We have considered approximately 1250 applications. Speaking in round numbers, 900 of those have been accepted for certification without examination. Approximately 125 have been rejected, 100 even have been admitted to the examination and we are holding about 125 for further consideration.

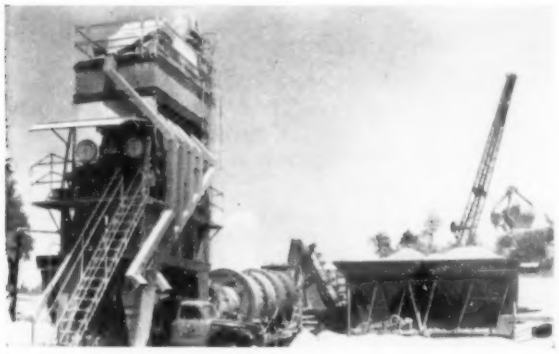
By way of explaining the amount of work involved, I remind you that to begin with, the application has to be reviewed to make sure that all of the required information is supplied. In instances where photographs are not included or where the $10 application fee has not been sent, letters have to be sent out. Strange to say, there were an appreciable number in which that was necessary. In the routine processing, we send letters to each one of the three general references. We also send a letter to at least one of the work experience references. The state registration must be verified although in most cases, this is done by referring to the official roster of the state involved. This takes time.

If the individual's name does not appear in the roster of the state he mentions, it is then necessary to write to the State Board of Registration to see whether or not he might have been registered subsequent to the issuance of the last roster. In some cases it is necessary to get more references than those we normally obtain. Then at the meeting itself, you know the routine. Each application is given serious consideration. The entire specialty committee considers all applications that are considered for rejection. The entire Board of Trustees again considers each application submitted for rejection. This takes time. There is correspondence coming in that requires attention and in the matter of clearing up after

Machines of tomorrow ready to cut your costs today



With capacities from 20 to more than 200 tons per hour, Barber-Greene Continuous Asphalt Plants offer unmatched portability, automatic operation, interlocked proportioning, and the ability to meet the most exacting specifications. The human element is eliminated, and manpower requirements reduced to the minimum. Erection consists merely of spotting the units at the job site and jacking into position.



The only batch plant designed for truly automatic operation, Barber-Greene BatchOmatic simultaneously measures all sizes of aggregate and eliminates the human element in achieving accuracy and maximum capacity. Instantly switched from automatic to manual operation and from manual to automatic. New Dyna-Mix pugmill gives thorough coating in less time than any other batch pugmill made. Instant, positive inspection of aggregate gradation and weight. Available in 2000-, 4000- and 6000-pound sizes.

The new Model 879-B Finisher is establishing even higher standards of speed, accuracy and economy. Latest improvements include greater receiving hopper capacity, new transmission for faster operating and travel speeds, higher-speed tamper for faster laying speeds, new crawlers which further decrease maintenance costs, and new power unit with 20% more power for pushing even bigger trucks and handling even steeper grades. Automatic leveling and independent tamper combine to produce a level surface that will stay level under rolling and traffic.

Write for literature on the world's most modern asphalt paving equipment.

58-17-AL

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

each meeting, there is a lot of work. It is necessary to advise everyone what action was taken on his particular application. In the case of those who were certified, it is necessary to have certificates prepared, send them around to get the necessary signatures and then mail them to individual persons. All in all, it's a whale of a job. I don't think we have to make any excuses about the time involved but I do feel that it is helpful for people to understand how much work is necessary.

F. B. Elder
Secretary
American Sanitary Engrg. Intersociety Board, Inc.
New York, N. Y.

Editor's Note: At the Chicago meeting in February, the first session ran from 9 AM to 1:30 AM the following morning; and on the next day from 9 AM to nearly midnight.

• • •

Sales Engineer Available

Mechanical Engineer with sales experience in sewage and water treatment field seeks connection with manufacturer's agent with opportunity for future partnership. Able in promotion with consultants and negotiation with contractors. Will relocate. Box 6-1, % Public Works, Ridgewood, N. J.

Sewage Treatment Plant Operation in New York City

It cost $27.46 per million gallons to treat New York's sewage which was estimated as amounting to 261,-620 million gallons in 1957. Solids captured amounted to 101 million cu. ft.; more than a billion cubic feet of gas was produced by sludge digestion and 45,700,000 kwh were manufactured by utilizing the gas. Most of the sludge was dumped at sea.

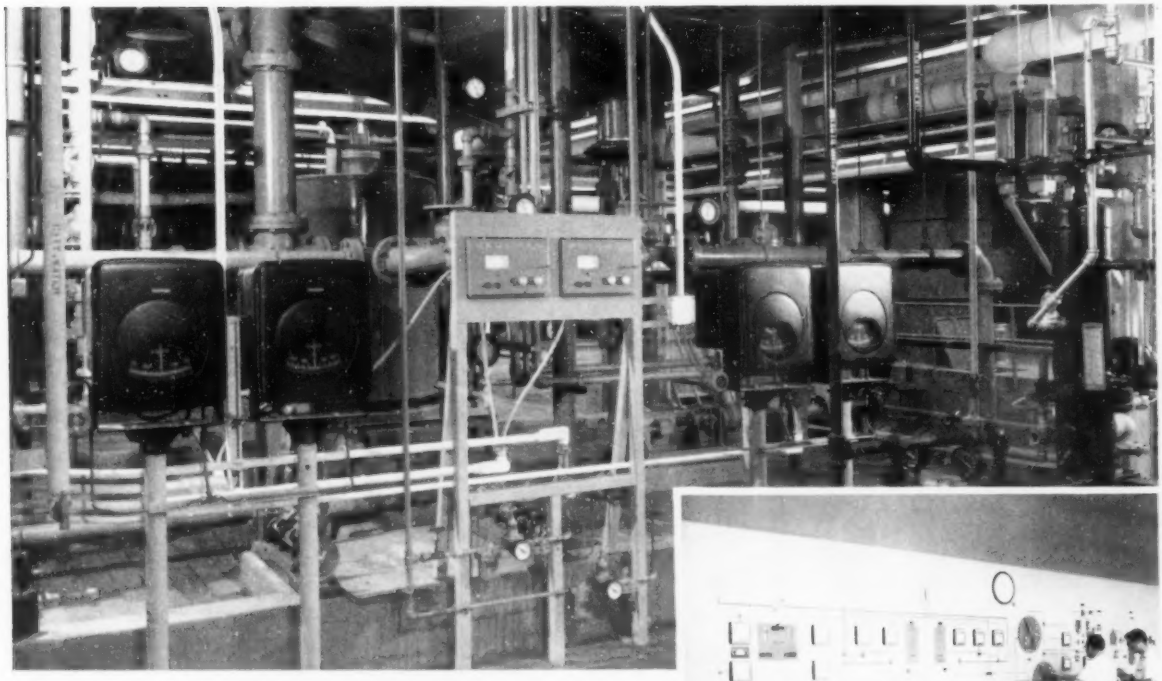
Pumping Station Efficiency and Cost

The Reno Low Service Pumping Station of Toledo, O., pumped 25,135 million gallons of water during 1957. The average head was 57.65 ft. and the average wire to water efficiency was 62.02 percent. The overall station operating cost was $5.3923 per million gallons pumped.

The Collins Park High Service Station pumped 23,484 million gallons in 1957. Average daily pumpage was 64.34 mg; the maximum day was 97.72 mg; the minimum day 42.02 mg; the maximum hour at the rate of 141.0 mgd; and the minimum hour at the rate of 28 mgd.

at **BOEING**
Airplane Company...

• Four Foxboro Dynalog oxidation-reduction potential transmitters form the heart of this Chromate Waste Reduction System at Boeing Airplane Company. Dynalog instruments transmit pneumatic signal to remote control panel (below). Two Beckman pH Amplifiers can be seen in the center. Consulting engineers: Wilson & Company, Salina, Kansas.



Central Graphic Control Panel for Boeing's Industrial Waste Treatment Plant. Panel includes controllers for flow and liquid level of various tanks, as well as recorder-controllers for the Foxboro ORP meters.

TOXIC CHROMATE WASTE

is rendered harmless

using Foxboro continuous waste control system

At the Boeing plant in Wichita, Kansas, toxic hexavalent chromate waste from plating tanks must be reduced to trivalent chromium. Control of this complicated reduction process is handled by a Foxboro Continuous Waste Control System.

Four Foxboro ORP (oxidation-reduction potential) Meters are the heart of the system. These sensitive instruments take continuous ORP electronic measurements — pneumatically control addition of sulphur dioxide when oxidation potential starts to rise.

Simple or complex — waste treatment systems are everyday business for Foxboro. Years of experience, plus pace-setting instruments like the Foxboro Magnetic Flow Meter, the Foxboro Dynalog* Recorder, and the Foxboro ORP Recorder have made it possible.

Write us about your industrial waste treatment problem. We'll be glad to send you literature — or have an engineer call on you at your convenience. **The Foxboro Company, 266 Norfolk St., Foxboro, Mass.**

*Reg. U. S. Pat. Off.

FOXBORO
REG. U.S. PAT. OFF.
WASTE CONTROL SYSTEMS

won't

"RECKON WE'LL HAFTA CUT YORE WHISKERS LOOSE, PAW... THESE TYTON JOINTS IS TIGHTER'N GRAN'MAW'S CORSET."

U.S. cast iron PIPE

FOR WATER, SEWERAGE AND

let go!

Grandpaw's whiskers are proof! Tyton Joint® pipe seals permanently and bottle-tight.

It's easy to assemble, too. A specially designed rubber gasket fits into the bell of the receiving pipe. When the connecting pipe slides into place the gasket is compressed and presto!... a perfect fit! No bell holes, no caulking, no nuts or bolts to fasten. Even green crews look expert in handling it. Tyton Joint pipe doesn't mind the weather, either. You can lay it in rain or a wet trench when you have to.

Call or write today and get *all* the facts about Tyton Joint pipe. Facts that can save you money, time and trouble.

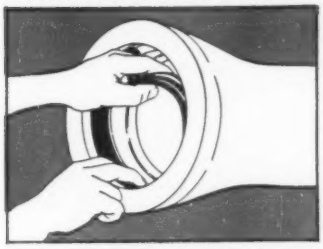
U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER FROM MINES AND BLAST FURNACES TO FINISHED PIPE

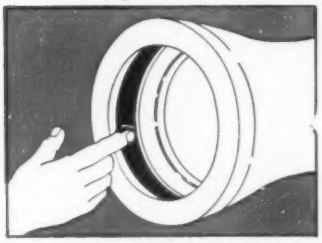
INDUSTRIAL SERVICE CAST IRON

TYTON JOINT

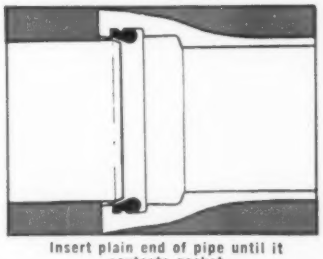
ONLY FOUR SIMPLE ACTIONS



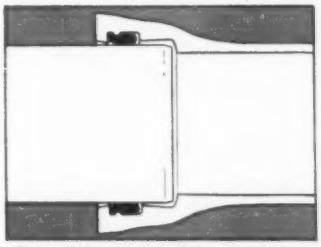
Insert gasket with groove over bead in gasket seat



Wipe a film of special lubricant over inside of gasket



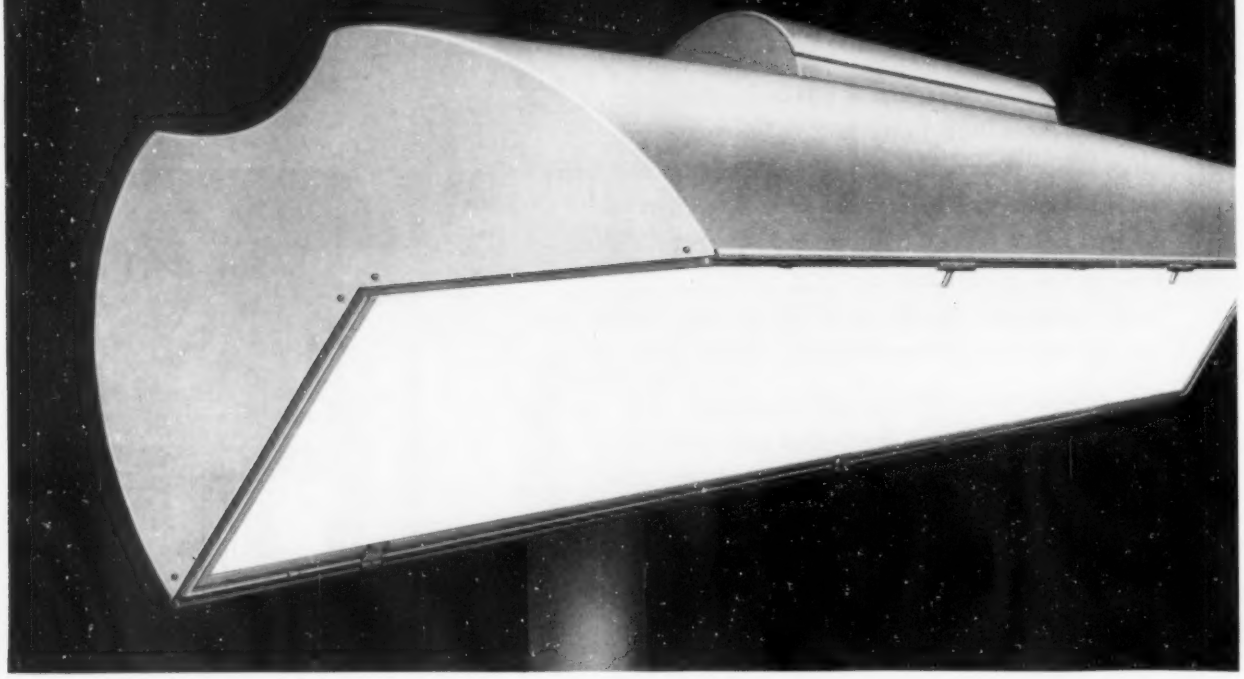
Insert plain end of pipe until it contacts gasket



Force plain end to bottom of socket... the job's done!

12" Tyton Joint pipe for water line in Florida

New VISTA-LINER



20% to 30% more light

than any other fluorescent flood-lighting equipment

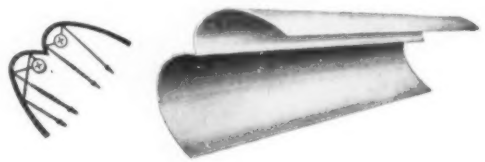
With "Squared Beam" Control!
Fewer fixtures are needed!
Municipal flood-lighting now more practical than ever!

This new Westinghouse VISTA-LINER gives you opportunities for flood-lighting improvements like you have never had before!

Vista-liners have the first truly ultra-modern appearance—a unique design that your community can point to with pride, today and for years to come!

Westinghouse Vista-liners are the first fluorescent floodlights to take advantage of the new super-high-output fluorescent lamps—and do it in a way that appreciably increases luminaire output! Then they provide a sharply defined control of light distribution—that formerly was possible only with incandescent lamps!

They are the first to use the new Bryant snap-in sockets, with stainless steel springs that *do not carry current!* This means less maintenance and improved lamp performance!



This superior Alzac-processed reflective surface is specially contour-engineered, by Westinghouse, to better serve *each* lamp.

by Westinghouse

per watt

This new contour gives Vista-liners a dual optical system with 15% more reflective surface than other designs, to direct the light-source rays. Furthermore, this reflector is shaped so that fewer light-rays are absorbed. Fewer are trapped in opposing lamps. At least 15% more lamp-lumens are released! And Vista-liners produce from 20% to 30% *additional* light from the *same* input!

J-04458

YOU CAN BE SURE... IF IT'S

Westinghouse

"Squared Beam" Control Simplifies All Flood-lighting Plans!

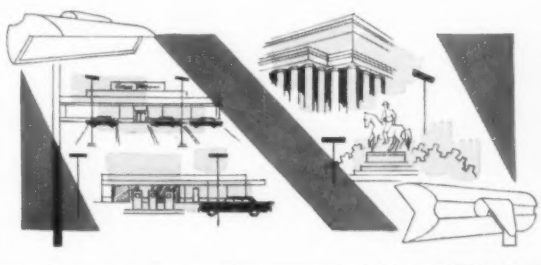
The Vista-liner's housing has "square" ends. Its lens is rectangular. Its optical system therefore projects a relatively "squared beam."

This simplifies all flood-lighting applications and layout. It is easier to plan for and distribute squared areas of light than it is to arrange round areas. The difficulties of over-lapping light-beams do not occur! No light need be wasted beyond the area or the subject to be flood-lighted! Fewer fixtures are needed! And complaints over glare are eliminated!

VERSATILE AND RUGGED

Vista-liner housings of indestructible fiber-glass are especially light in weight. A wide variety of cast-aluminum brackets permits the mounting of Vista-liners virtually "anywhere"—close to the pole—or on adjoining structures. New design ballasts, with separate capacitor—rugged in construction for outdoor service—are mounted inside the cast-aluminum bracket. Since ballast heat is removed from the optical system, the lamps operate at a more efficient temperature.

Your nearby Westinghouse Lighting Engineer will gladly help you with technical problems. Call your Westinghouse Representative today. Or write directly to Westinghouse Electric Corporation, LIGHTING DIVISION, Edgewater Park, Cleveland, Ohio.



EQUIPMENT and MATERIALS

FOR YOUR

PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Velocity Type Totalizing Flow Meter

66. The Propeloflo propeller-type totalizing flow meter is covered in 6-page Bulletin 380-K4B from Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I. Included are functions of the unit, installation, application, accuracy and pressure loss graphs, data tables and charts. Check the reply card.

Valuable Catalog on Drawing Instruments

126. Compasses, ruling pens, drawing sets and drafting sets are covered in a 20-page catalog from V & E Mfg. Co., P. O. Box 950-M, Pasadena, Calif. Check the reply card for types, models and prices.

Catalog on Transits and Levels

130. Bulletin 100-PI describes in detail Japanese made transits and levels that are available to the engineer, surveyor and contractor. Write to Precision Instruments, Inc., 1900 Fifth Ave., Troy, N. Y., or check the reply card.

Highway Lighting Engineering Guide

207. This catalog is primarily aimed at the new highway lighting program that is being undertaken nationally. It gives data on the quantity of light required; lighting on main traffic lanes, interchanges, intersections, toll plazas and bridges. It also covers information on the relative cost of lighting and the selecting of the light source. Write to Westinghouse Electric Corp., Lighting Div., 1216 West 58th St., P. O. Drawer 5817, Cleveland, Ohio, or check the reply card for your copy.

Measuring Tapes, Rules and Tape Rules

136. Tape and rule Catalog No. 104 covers 160 pages on measuring devices and is available from The Lufkin Rule Co., 1730 Hess St., Saginaw, Mich. Engineers and surveyors check the reply card for your copy.

Graders With Torque Converters and Power Shift Transmissions

142. Described in Bulletin No. HWG-508 is the Huber-Warco 50-190, 195 hp grader. Features include power sliding moldboard, easy to reach controls, four-wheel brakes and retractable scarifier. Write Huber-Warco Co., Marion, Ohio, or check the reply card.

Automated Earthwork Computation

144. The Univac 120 electronic computer can solve earthwork problems, compute alinement and curve widening data and give grade elevations. Check the reply card or write Remington Rand Univac, Div. of Sperry Rand Corp., 315 Fourth Ave., New York 10, N. Y., for full information on electronic computer problems.

Modern Compaction Methods and Equipment

200. This 52-page Manual covers modern day compaction methods and equipment, rubber-tire rolling, compaction of asphalt mixes, aspects of vibratory compaction, stage compaction on cohesive soils and compaction of asphaltic concrete surfaces. Check the reply card or write Road Machinery Div., Bros Inc., 1057 Tenth Ave., S. E., Minneapolis 14, Minn., for your copy.

Cutting Edges For Bulldozers and Scrapers

202. Illustrated throughout with photographs and drawings, the 8-page, 2-color bulletin describes in detail cutting edges for bulldozers and scrapers. Check the reply card or write Caterpillar Tractor Co., Peoria, Illinois.

MORE LISTINGS ON PAGES 34 TO 54

Leaf Loader and Collector

204. Complete line of vacuum type equipment for leaf and litter problems is available from Good Roads Machinery Corp., Minerva, Ohio. Units are available truck or trailer mounted and are used to maneuver in hard-to-reach places. Check the reply card.

Contraflo Upflow Clarifiers

215. Upflow clarification complete with description, drawings and tables is covered in 9-page bulletin from General Filter Co., Ames, Iowa. Pictures of municipal and industrial plant installations are included. Check the reply card.

Pre-Cast Lee-Tite Clay Pipe

219. How to cut jointing time and reduce sewer and drain installation costs with Lee-Tite clay pipe is illustrated in bulletin from Lee Clay Products Co., Inc., Clearfield, Ky. Check the reply card for information on this bituminous jointed clay pipe.

Rubber Roads Are Now a Reality

230. Ramflex, a free-flowing, devulcanized rubber specially prepared to be used in combination with asphalt for highway paving applications is described in illustrated catalog from U. S. Rubber Reclaiming Co., Inc., P. O. Box 365, Buffalo 5, N. Y. Check the reply card.

Foxboro Magnetic Flow Meter

238. The Foxboro magnetic flow meter measures water and wastes electrically, without any line restriction. No loss of head, no fouling, even with slurries. For detailed illustrated Bulletin 20-14B check the reply card or write The Foxboro Co., Foxboro, Mass.

Outline of Modern Water Treatment Equipment

248. Bulletin 4433 is recommended for engineers who need a basic refresher course on treatment of municipal and industrial water. It lists water impurities and methods of treatment and illustrates treatment systems and equipment. Check the reply card or write The Permutit Co., 50 West 44th St., New York 36, N. Y., for your copy.

3-Wheel Roller With Vibratory Compactor

252. Bulletin 423 shows how to get the static compressing action of massive roller weight plus the consolidating action of vibration with one machine. Write The Galion Iron Works & Mfg. Co., Galion, Ohio, or check the reply card for construction features and complete compression tables.

Manual on Solving Drainage Problems

255. A 74-page Manual on the problems of drainage and drainage materials is available. Design section includes determining culvert lengths and sizes, run-off calculations, excavation of base and backfilling data. Check the reply card or write Bethlehem Steel Co., Bethlehem, Pa., for this valuable book.

How to Select Flowmeters

273. Technical Bulletin 91-119 gives criteria for choosing the type of flowmeter to be used in measuring a given fluid or liquid. Write Fischer & Porter, 547 Jacksonville Road, Hatboro, Pa., or check the reply card for advantages and limitations of the basic types available.

Separators and Thickeners for Water, Sewage and Waste Treatment

275. Photos and diagrams are used extensively in Bulletin 315-101 to illustrate the design features, the types of tanks used and the operating principles of Float-Treat separators and thickeners. Check the reply card or write Chain Belt Co., Dept. P. R., Milwaukee 1, Wisc., today.

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DALLAS — CHICAGO — SAN FRANCISCO — LOS ANGELES

To order these helpful booklets check the reply card opposite page 18.

NEW LISTINGS (Cont.)

Dewater Sludge Mechanically Without Chemicals

123. The Heymann sludge thickener dewaters raw or digested sludge without using chemicals, heat, or additives: a vibrating screen and a roller press comprise a single package unit for solving sludge handling problems. Write Sonic Separation, Inc., P. O. Box 37, Lake Hiawatha, N. J.

Steel Forms For Precast Prestressed Concrete

128. Watco forms are permanent or portable and interchangeable and the use of liners, inserts and filler channels permits production of sections in a wide range of sizes from one form. Check the reply card or write Plant City Welding & Tank Co., Concrete Form Div., P. O. Box 1308, Plant City, Fla., for data on these precast prestressed concrete forms.

Corrugated Metal Pipe Culverts and Pipe Arches

160. Corrugated metal pipe, pipe arches, coated and paved pipe, perforated pipe and tunnel liner plates are covered in Catalog No. 5-7-57 from Young & Greenawalt Co., 5016 Hohman Ave., Hammond, Ind. Also included are structural plate for large culverts.

Highway Truck Tire Data Book

225. This 42-page book lists and describes the 9 factors of maintenance of truck tires and lists and describes the complete line of B. F. Goodrich truck tires and carries tables on load and inflation and weights and measures. Check the reply card or write The B. F. Goodrich Tire Co., 500 S. Main St., Akron, Ohio, today.

Story of the Analogue and Digital Computer

269. Organization of digital computers, the stored program, processing, storage and other data are described in attractive catalog from I B M Corp., 590 Madison Ave., New York 22, N. Y. Check the reply card.

Flexible Polyethylene Plastic Pipe For Water Use

278. Pipe sizes and fittings, instructions on how to install, chemical resistance and technical properties are some of the items covered in Bulletin CE-5 on plastic pipe from Supplex Co., Garwood, N. J.

Standard Close Coupled Centrifugal Pumps

282. Centrifugal pump sizes, range charts, sectional views and part lists are covered in Catalog No. 19; available from Dean Brothers Pumps Inc., 323 W. 10th St., Indianapolis 7, Ind. Check the reply card today for design specifications.

The Principles of Compaction by Vibration

288. Compaction specifications that can't be met with ordinary compactors are no problem to the new Essick vibrating rollers. Complete descriptive literature explaining the principles of compaction by vibration and the Essick vibrating roller is available from Essick Mfg. Co., 1950 Sante Fe Ave., Los Angeles, Calif.

Use The Reply Card

Why and How To Use Pneumatic Tired Rollers

290. The why and how of pneumatic tired rollers on base and surface courses, sealing completed fills, surface treatments, floated surfaces, hot and cold asphalts and stabilized soils are covered in Bulletin 10 from Tampo Mfg. Co., San Antonio, Tex. For information on operating conditions and compaction charts check the reply card.

Manual on the Use of Calcium Chloride

301. This manual presents the physical and chemical properties of the new pellet-type calcium chloride and its water solutions. Also, gives complete data on shipment, handling and storage. Check the reply card or write The Dow Chemical Co., Midland, Mich., for your copy.

Municipal Signs For Streets, Roads and Traffic Regulation

302. Embossed porcelain signs with cast or extruded aluminum frames or with no frames are covered in literature available from Municipal Street Sign Co., Inc., 777 Meeker Ave., Brooklyn 22, N. Y. Also, included is data on solid cast aluminum signs that are plain or reflectorized and embossed baked enamel signs. Check the reply card.

Permene Filament For Sweeper Brooms

304. Synthetic brush filament that can give 4 times as many sweeping miles in street sweeper brooms is covered in information from O-Cedar Industrial Products, Div. of American-Marietta Co., 2246 W. 49th St., Chicago, Ill. Check the reply card today.

Engineering Layouts For Walking Beam Flocculation Units

306. Covered in this design bulletin are sections on drive locations, flocer spacing, trough spacing, designs and sizes, and specifications of the flocculation mechanisms. Check the reply card or write Stuart Corp., 516 N. Charles St., Baltimore 1, Md., today.

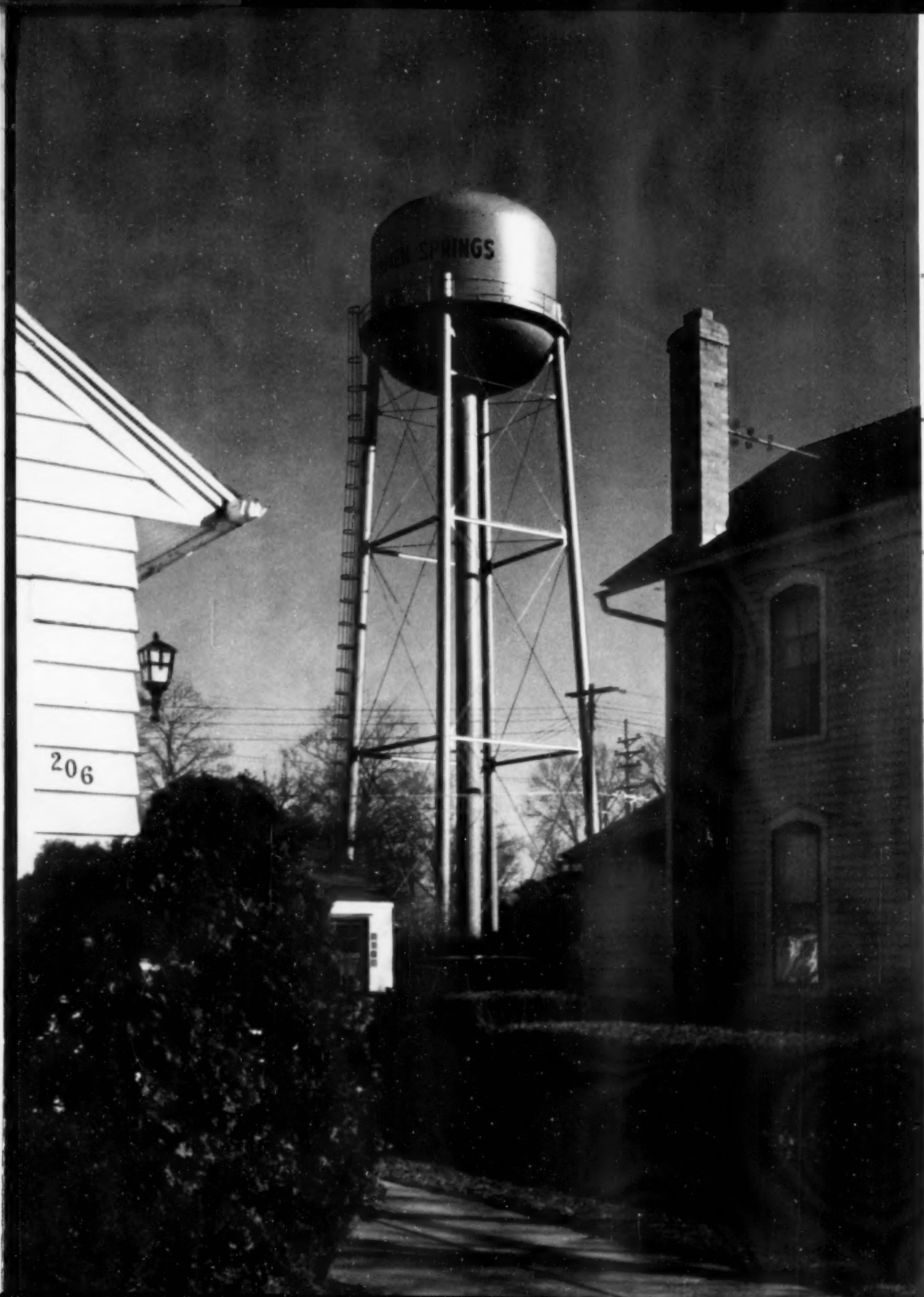
Manual Valves Made Automatic By Tork-Master

310. Tork-Master makes manual valves automatic and it converts a manual operation to an automatic operation without removing valves during changeover. For full data write General Controls, Glendale, Calif., or check the reply card.

Literature on Armco Steel Buildings

311. Described in this bulletin are steel buildings featuring the Steelox panel construction and types include shed roof, gable roof frameless and gable rigid frame. Check the reply card or write Product Information Service, Armco Drainage & Metal Products, Inc., Middletown, Ohio, for data on 5,000 sizes.

(More listings on page 38)



FILE REFERENCE

FACT SHEET

GRAVER®

How A Small Rural Community Solved Its Water Supply Problem

Dr. J. M. Brown, Village President
Arthur W. Robinson, Water Superintendent
Charles O. Herman, Village Clerk
Williams & Works
Consulting Engineers
Grand Rapids, Michigan
Raymond L. Elliott, Project Engineer
Graver Tank & Mfg. Co., Inc.
Design, Fabrication and Erection

Type: Double Ellipsoidal Elevated Tank
Capacity: 150,000 gallons
Height to Overflow: 128′
Head Range: 28′
Diameter of Tank: 32′ 0″
Built to AWWA Specifications
Painted and Sterilized
Cathodic Protection and Lighting Included

THE PROBLEM

The water supply of the growing rural community of Berrien Springs, Michigan (population 1,761), was adequate for normal demands but insufficient for summer sprinkling and fire protection. Furthermore, in terms of expected population growth, the system—installed in 1914—was woefully limited. The old system would be required to meet a demand for over 2,000 gallons per minute while the capacity of the wells was limited to 1,500 gallons per minute.

THE SOLUTION

An enlarged storage supply was the answer. The purchase of a new elevated water tank of 150,000 gallons capacity to replace the existing 50,000 gallon tank was recommended. Without increasing the present pumping capacity, the larger tank provided enough storage to meet the demand of over 2,000 gallons per minute for a five hour peak period. This also assured the needed water to protect the community from fire.

Graver was selected to design, fabricate and erect the 150,000 gallon elevated water tank and to paint, sterilize, light and cathodically protect it before completion. Graver also dismantled and removed the old tank.

The teamwork between the Village officials, the Water Superintendent, and consulting engineers and Graver resulted in an excellent solution to the need for additional water at the lowest cost.

Water storage and pressure problems are being solved regularly by villages and cities across the country with Graver's help. Graver's experience of over a hundred years with tank fabrication and erection contributes directly to the solution of these problems, through conferences with a consulting engineer and with Graver.

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WHICH TYPE OF WATER STORAGE IS BEST FOR YOUR NEEDS?

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BUILDING FOR THE FUTURE ON A CENTURY OF CRAFTSMANSHIP IN STEELS AND ALLOYS

NEW LISTINGS (Cont.)

Pneumatic Sewage Ejector Pumping Systems for Low Flows

317. Dimension and capacity tables for pneumatic float or electrode controlled ejectors, cast iron or welded steel, covering flow ranges of 20 to 600 gpm, including all information necessary in design are given in Bulletin No. KSM-2 3/58. Check the reply card or write Komline-Sanderson Engineering Corp., Peapack, N. J.

Simplify Sewage Plant Design with Couplings

319. How to use style 38 Dresser couplings to the best advantage in sewage treatment plant design are illustrated with typical piping diagrams and size and specification tables in 18-page bulletin. Check the reply card or write the Dresser Mfg. Div., Bradford, Pa.

Literature on Tunnel Washers

323. Ross and White Co., Chicago Daily News Bldg., Chicago 6, Ill., has available information on mechanical tunnel washers that scrub and rinse walls and ceilings. Check the reply card for full data.

Morton Purex Salt For Water Plants

324. Sludge-free Morton Purex salt is described in literature from Morton Salt Co., Industrial Div., Dept. PW 6-58, 110 N. Wacker Drive, Chicago 6, Ill. Check the reply card for information on this 100 percent soluble salt.

Automatic Drilling Machine For Cutting Any Type of Pipe

325. The CL-12 drilling machine may be hand or power operated and will make cuts from 2 to 12 inches through any type of pipe. Check the reply card for full details or write the Mueller Co., Decatur, Ill.

Complete Specifications on Aluminum Fencing

327. Chain link fence of Alcoa aluminum for highways, divider strips and rights-of-way have 30 rust-free years without painting. Check the reply card or write Aluminum Company of America, 2147-F Alcoa Bldg., Pittsburgh 19, Pa., for File 14-K that contains complete specifications and technical data.

Convertible ½-yd. Hydrohoe, Hydroshovel and Hydrocrane

338. The Bucyrus-Erie H-5 Hydrohoe combines high production with mobility and flexibility. Check the reply card or write Bucyrus-Erie Co., South Milwaukee, Wisc., for details on this unit that can be converted to a crane, clamshell, backhoe and shovel.

•

WATER WORKS

Elevated Tanks and Other Storage Facilities

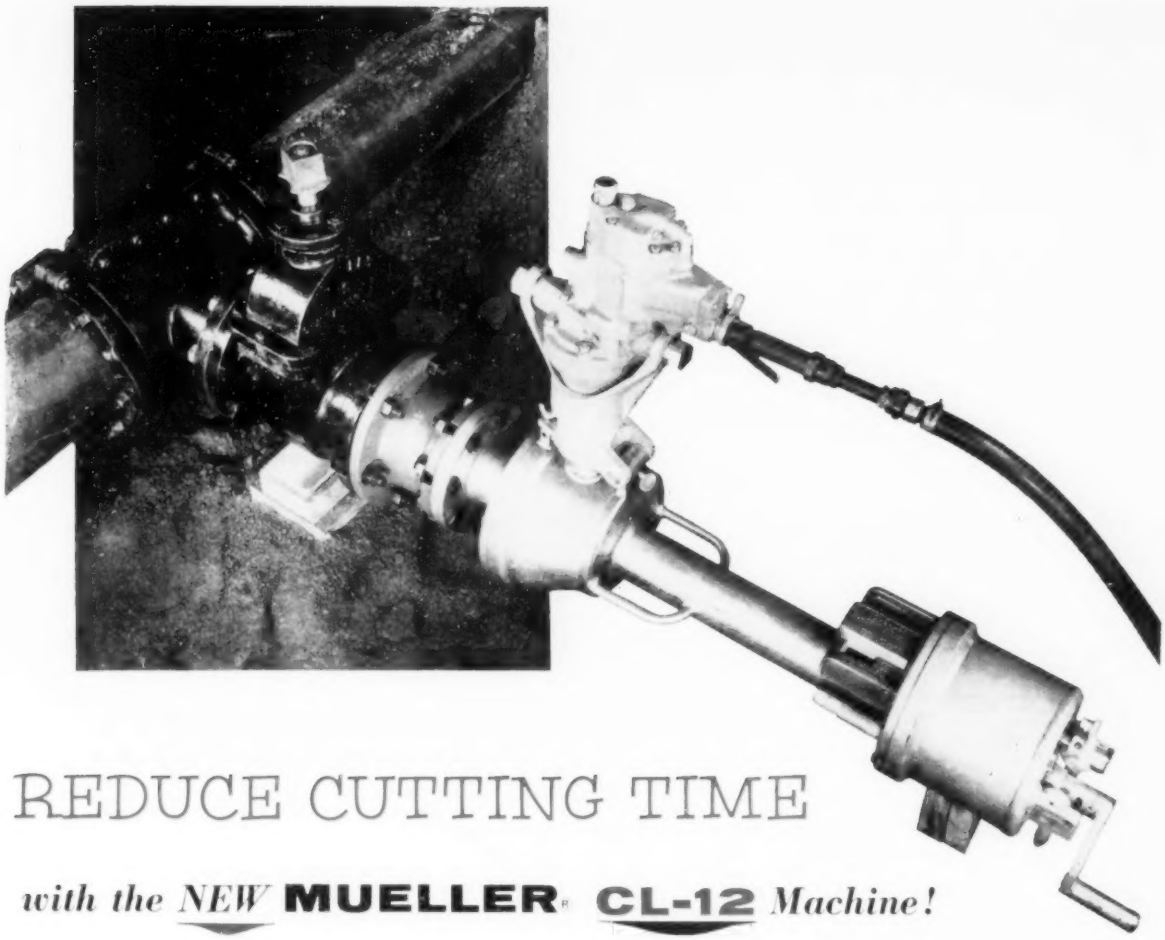
32. Specification sheet covering elevated tank sizes and design and illustrated brochure available from the Darby Corp., Kansas City 15, Kansas.

Modern Electronic Pipe Detector

46. Detect, trace and center pipes and cables and be able to estimate their depth with these new detectors. Check the reply card or write Computer-Measurements Corp., 5528 Vineland Ave., Dept. 55-B, North Hollywood, Calif., for this complete catalog on this electronic device.

Handbook of Cast Iron Pipes and Fittings

52. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference. Requests for this valuable publication should be accompanied by your business letterhead.



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■ Now — Mueller Co. has developed a fast, automatic drilling machine for making cuts from 2″ through 12″.

The new CL-12 Machine may be hand operated with a ratchet handle or power operated with the Mueller H-601 Air Motor or H-602 Gasoline Engine Drive Unit. No changes in the machine are needed to use either method of operation.

New design and new features also reduce set-up time. Automatic power cutting completely frees the operator for other work around the job-site. *Total on-the-job time is drastically cut!*

Write today or contact your Mueller Representative for full details on the new Mueller CL-12 Machine.

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Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

To order these helpful booklets check the reply card opposite page 18.

Valuable Bulletin on Rodney Hunt Sluice Gate

61. Sluice gate seats on a resilient rubber seal flush with the bottom of the channel and eliminates bottom wedges and the trough in which they descend. Gives design flexibility in water filtration, sewage treatment and sluices, dam, channel and chamber flow control. For complete details write to Rodney Hunt Machine Co., 82 Lake Street, Orange, Mass. for Bulletin 75, or check the reply card.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Easily Cleaned Long Run Filter Bed Media

70. Bulletins on Anthrafilt tell the reasons why selected, graded crushed anthracite is superior to sand as a filtering material. Have you made a full investigation? Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D Wood Co. Independence Sq., Philadelphia 5 Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves.

Automatic Engine Control Equipment Manual

83. This catalog contains descriptions of standard automatic and semi-automatic controls and control equipment. General control recommendations, control selection chart, accessory selection chart, safety stop controls and alarm sets are sections covered. For price lists and models available write Synchro-Start Products, Inc., 8151 N. Ridgeway, Skokie, Ill.

Helpful Reference on Swimming Pool Equipment

87 A complete reference catalog of swimming pool supplies, chemicals and equipment is available from Modern Swimming Pool Co., Inc., 1 Holland Ave., Dept. PW, White Plains, N. Y. Detailed information covers filters and accessories, all types of fittings and equipment and helpful suggestions on chemical treatment and pool maintenance. Get your copy of this 52-page book by checking the reply card.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Darling Aluminum Gate Valves and Check Valves

99. Specifications and dimensions of Darling aluminum gate valves and check valves are covered in literature from Darling Valve & Mfg. Co., Williamsport, Pennsylvania. Check the reply card.

Right Angle Gear Drive For Centrifugal Pumps

107. Applications, gear drive selection tables, pulley data, efficiencies and standard dimensions of Johnson right angle gear drives are covered in catalog from Johnson Gear & Mfg. Co., Ltd., Eighth and Parker Sts., Berkeley 10, Calif. Check the reply card.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Service Saddles Used in Water Line Connections

114. Service saddles from M. B. Skinner are rugged malleable iron construction, with a full length hinge on one side and single extra-oversize plated bolt on the other. Write M. B. Skinner Co., South Bend, Ind., or check the reply card for literature.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the reply card for full information including table of filter sizes and capacities, space required and filter operation.

Technical Data on V-Notch Variable-Orifice Chlorinator

152. The Series A-731 chlorinator is adaptable to any type of chlorinator control and provides wide range adjustment and excellent reproducibility of chlorine flow. Check the reply card or write to Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J., for design features, flow diagrams and operation data.

All-Electric Floatless Liquid Level Control

174. Description of operating principles and application of B/W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest bulletins for engineering data, diagrams of typical installations and details of component parts. Check the reply card or write B/W Controller Corp., Dept PW, Birmingham, Mich.

Lay Water Mains Faster With "Fluid-Tite" Couplings

184. Get permanent water-tight joints automatically with K & M "Fluid-Tite" couplings for K & M asbestos-cement pressure pipe. Full details on this faster installation and self-energizing couplings are available from Keasbey & Mattison Co., Ambler, Penna.

Submersible Pumps For Municipal Use

185. A new 12-page bulletin that describes the line of BJ submersible pumps is available from Byron Jackson Pump Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. Construction and operation of the pumps are covered along with a handy selection chart that gives capacity and head performance.

What You Should Know About The Centriline Process

197. The Centriline method for cement mortar lining water mains 16" thru 144" in place to stop leaks, prevent corrosion, increase carrying capacity and decrease pumping costs is fully described in a handsome booklet issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economies of this process. The Tate process for lining smaller mains is also covered.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Use The Reply Card

Manual on Pipe Finding Techniques

213. A manual on special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines. Check the reply card for your free copy.

Complete Story of Rubber as a Coupling Medium in Pipelines

295. "Joint Enterprise", a booklet describing Tylox rubber joints for coupling pipe used in sewerage, drainage and waterworks projects is now available from Hamilton Kent Manufacturing Co., 7 West Grant St., Kent, Ohio. The booklet also contains illustrated case histories of Tylox-jointed installations, and suggestions to assist engineer in specifying Tylox joints for both tongue and groove, and bell and spigot pipe. Check the reply card.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check reply card for your copy.

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for top performance, long life, low upkeep . . .

Leopold

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LEOPOLD GLAZED TILE FILTER BOTTOMS

• Permanent • Can't corrode • Acid and alkali-resistant • Not subject to tuberculation • Performance proved in over 375 plants with a daily capacity of over 2¼ billion gallons.

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• Require no painting or other costly maintenance • Easy to handle—inexpensive to install • Resist weather and last indefinitely • Available for all design requirements. Also ideal for weir plates, collector troughs, baffles, etc.

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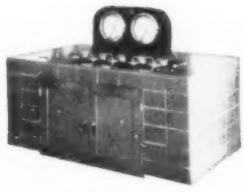
• Provide positive bubble-tight closure • Designed for quick, economical installation, easy operation, minimum upkeep.



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• Available in three capacities for fast volume batch feeding of dry chemicals.

Whether adding new plant capacity or modernizing present facilities, it will pay you to use Leopold Filter Plant Equipment. You'll find Leopold products can't be beat for efficiency, long life, and overall economy. Any way you judge them, they're your best buy. We would like to give you valid reasons why—without obligation. Just mail coupon below.

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☐ **Please send literature on complete line of Leopold products.**

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To order these helpful booklets check the reply card opposite page 18.

Centrifugal and Turbine Type Pumps For Water and Sewage Plants

321. Turbine-type pumps, close or flexible couple drive, side suction centrifugal pumps and mixed flow pumps are described in Catalog M available from Aurora Pump Div., The New York Air Brake Co., Loucks at Dearborn, Aurora, Ill. Included is a pump selection guide.

Manual on the Hersey Disc Water Meter

329. Illustrations, descriptions and specifications of Hersey water meters are covered in manual available from Hersey Mfg. Co., 250 Elm St., Dedham, Mass. Size ranges are 5/8"-5/8"x3/4"-3/4" and 1". Check the reply card.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa.

Technical Bulletin on Swimming Pool Filtration Equipment

335. A 24-page technical Bulletin 626, designed to help persons planning pools which must comply with local and state health regulations, is now available from the R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. Check the reply card for data on size selection charts, typical installations and drawings.

Tips for Installing Orangeburg Pipe

336. Good practice for installation of Orangeburg pipe and fittings is outlined in an illustrated four-page bulletin made available by the Orangeburg Mfg. Co., Inc., 375 Park Avenue, New York 22, N. Y. Trenching and backfilling, pipe laying, cutting and connecting with other types of pipe are included. Use the reply card for your request.

Use The Reply Card

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Red Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Check the reply card.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 300 Park Ave., New York 22, N. Y. Check the reply card.

Welded Steel Pipe from 6 to 10 3/4" Diameter

382. High grade butt welded light-weight steel pipe from 8 to 16-gauge in 20, 30 and 40-foot lengths, plain or asphalt coated, with choice of joints. Also available up to 0.188 wall. Check uses for municipal water lines, irrigation, well casings and many other applications. Self explanatory literature from Valley Mfg. Co., Valley, Nebraska.

What You Should Know About Hypochlorination

395. "Hypochlorination of Water" is the name of an informative publication issued by Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. In it there is a discussion of chlorination theory, practice and equipment; control of algae, tastes and odors; and laboratory testing.

Device Used to Regulate Flows of Liquids

396. Valuable data on details of design, capacities, dimensions and typical installations of the Simplex Type S Controller are covered in literature from Simplex Valve & Meter Co., 7 East Orange St., Lancaster, Pa. The unit regulates flow of liquids in filter plants and is used to maintain a uniform rate of filtration through each filter unit. Check the reply card.

To order these helpful booklets check the reply card opposite page 18.

Chapman
Standard Sluice Gates

276. Manual, hydraulic or electric motor control sluice gates are described fully in Catalog 25 available from The Chapman Valve Mfg. Co., Indian Orchard, Mass. These valves are easy to replace and are fitted without alterations. Check the reply card.

Cleaning and Relining
Water Pipe the Easy Way

397. Complete facilities for relining cast iron or steel water pipelines in place from 4" to 144" in diameter, with the Spunline (TM), Tate and Centriline Processes offered by Pipe Linings, 2414 E. 223rd St., Wilmington, Calif. For full information on cleaning and relining pipe with only momentary interruption of service, check the reply card.

Helpful Engineering Data
on Cast Iron Pipe

422. Complete data on McWane Super DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

Diatomite Filters
For Swimming Pools

424. Keep swimming pools clean and sparkling and clarify water and other liquids for industry by using Graver diatomite filters. How these filters work, filter elements, body feed equipment and backwashing are illustrated and described in Bulletin WC-115 available from Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y.

What You Should Know
About the Rubber Waterstop

448. A bulletin on the Servicised rubber waterstop has been released by Servicised Products Corp., 6051 West 65th St., Chicago 38, Ill. General information, engineering service, advantages of specifying the waterstop, specifications, general and detail requirements, installation and typical applications, standard sizes and types are fully covered.

Clow Bell-Tite
Cast Iron Pipe

280. Laying water mains is easier, faster and more economical with Clow Bell-Tite joint cast iron pipe. Joint employs a single rubber gasket as the only accessory. Complete details available in illustrated literature from James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill., or check the reply card.

Important Factors in
Water Meter Selection

463. Interchangeability of parts is an important advantage that is yours when you use Trident meters. The newest parts fit your oldest Tridents so you modernize when you repair. Get full data on the entire Trident water meter line by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.

U. S. Tyton
Joint Pipe

490. An eight page booklet on centrifugally cast, Tyton Joint pipe for water or other liquids has been announced. The newly developed Tyton Joint is simple, sturdy and tight. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co. Birmingham 2, Ala., or check the reply card.

Modern Elevated
Water Tanks

566. A 16-page bulletin describing 2 types of water storage tanks, the watersphere and the waterspheroid, is available from the Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill. Standard sizes from 25,000 gals. to 500,000 gals. are covered.

Meter For Measuring
Large Water Volumes

613. For metering large water volumes in closed conduits ranging in size from 4" to 72", a propeller type low pressure line meter is described in 28-page catalog from Sparling Meter Co., Inc., El Monte, Calif. Check the reply card for data on accuracy and head loss curves, detailed specifications and latest meter data.

Water Tanks,
Reservoirs and Standpipes

631. Data on steel water tanks, reservoirs and standpipes of all capacities are included in literature available from Graver Tank & Mfg. Co., Inc., East Chicago, Ind. These units are fabricated and erected by the company. Check the reply card.

Water Service Hydrants
and Outdoor Drinking Fountains

661. Water service hydrants in 4 sizes, ¾", 1", 1½" and 2" and all types of outdoor drinking fountains are described in a well-illustrated, 24-page catalog from The Murdock Mfg. & Supply Co., 426-30 Plum St., Cincinnati 2, O.

Manual on Valves, Fire
Hydrants and Accessories

670. Complete line of Iowa valves and hydrants are covered in this manual from Iowa Valve Co., Oskaloosa, Iowa. All equipment meets AWWA specifications.

Use The Reply Card

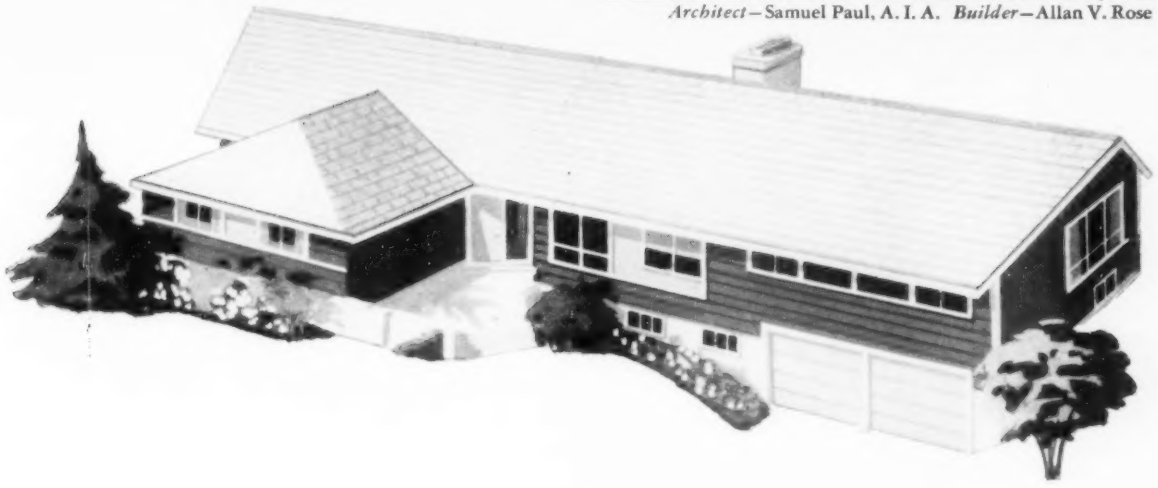
"Packaged" Electric Power
For Mobile Installations

656. A well-illustrated 8-page bulletin describing 3 Onan "packaged" power systems is available from D. W. Onan & Sons Inc., Minneapolis 14, Minn. Illustrated are battery charging with AC power, high battery charging output and battery charging only.

Handbook on Selecting
Power For Pumping

694. A 12-page power selection handbook, "Selecting Power For Pumping," has been released by the Advertising Div., Caterpillar Tractor Co., Peoria, Ill. This handbook is especially useful to those who have a pumping operation. It contains a checklist of features necessary for continued dependable operation on pumping jobs. List describes the proper requirements which an engine must have, backing them with illustrations and examples of efficient installations. Check the reply card today.

Installed in Lake Isle Estates "Show House" near Scarsdale, N. Y.
Architect—Samuel Paul, A. I. A. *Builder*—Allan V. Rose



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and the modern homes it's made for?

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for house to sewer or septic tank
BERMISEPTIC®
for septic tank disposal fields

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BROWN QUALITY COMPANY

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Mills: Berlin, N. H.; Corvallis, Ore.

BERMICO PIPE is solving house-to-sewer and house-to-septic-tank connection problems for modern housing everywhere. Builders have learned that they can't buy and install a more efficient, root-proof sewer pipe for less—and it lasts and lasts.

Authorities across the nation are changing municipal codes to include Bermico because...

Bermico Bituminized Fibre Pipe
Exceeds Federal Specification SS-P-356

This means that Bermico—made of tough cellulose fibres thoroughly impregnated with coal tar pitch—surpasses strict Federal Government requirements for *Water Absorption—Crushing Strength—Chemical and Kerosene Resistance—Hot Water Resistance—Heat Resistance—Resistance to Flattening—Beam Strength.*

Do you include Bermico Fibre Pipe in your codes? It's a real boon to any community. For information about communities that have put Bituminized Fibre Pipe in their codes, write Dept. EB-6, our Boston office.

To order these helpful booklets check the reply card opposite page 18.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N.J. Check the reply card and we will forward your request.

Flash Drying and Incineration System

35. Bulletin FD-57 outlines the problem of sewage sludge disposal and includes color diagrams and photographs that explain how the C-E Raymond System works in heat drying and incineration. Check the reply card or write Combustion Engineering, Inc., Raymond Div., 1319 North Branch St., Chicago, Ill., for full details.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Sparjer-Aerobic Package Sewage Treatment Plants

102. Bulletin 26-S-92 gives full details on the Walker Process Sparjer-Aerobic process package sewage treatment plants. Plant completely treats the sewage and sludge. Copies of bulletin are available from Walker Process Equipment, Inc., P. O. Box 266, Aurora, Ill., or check the reply card.

Packaged Underground Lift Station

124. Selection tables and detailed drawings of packaged underground lift stations with "Flush Kleen" sewage pumps are available in literature from Chicago Pump Co., 622 Diversey Parkway, Chicago 4, Ill. Check the reply card today.

Sewer Design Flow Chart Based on Manning Formula

154. A large-scale, convenient flow chart based on the Manning formula, together with typical examples of use, is available from Johns-Manville, 22 East 40th St., New York 16, N. Y. To get your copy check the reply card or write to the manufacturer and ask for Bulletin TR-94A.

Use The Reply Card

Bituminized Fibre Pipe For Sewer Connections

172. Bermico pipe for house to sewer or house to septic tank connections is described in literature from Brown Co., 150 Causeway St., Boston 14, Mass. Check the reply card for full details.

Tubular Conveyors Move Almost Any Flowable Material

190. Covered in this catalog on Hapman conveyors are a general description, materials handled, installations, design details, charts on weight-volume-time and capacities and applications. Check the reply card or write Stuart Corp., 516 No. Charles St., Baltimore, Md., for catalog.

Combination Unit Degritting Clarifier and Clarigester

782. Degritting unit provides positive mechanical grit removal with conventional clarification in a single tank. Bulletin No. 6412 is available from Dorr-Oliver Inc., Stamford, Conn., or by checking the reply card.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clarke Wilcox Co., 118 Western Ave., Boston 34, Mass. Check the reply card.

Dependable Engines for Sewage Treatment Plants

227. Climax Sewage Gas Engines are available for continuous duty operation to drive pumps, blowers or generators in a range of sizes from 40 to 250 HP. Use the handy reply card to obtain complete details and literature from Climax Division, Waukesha Motor Co., Box 379, Waukesha, Wisc.

Improved Design of Uniflow Settling Tanks

258. A bulletin on the Uniflow settling tank for removal of solids from water, sewage and industrial waste is available from Public Relations Dept., Link-Belt Co., Prudential Plaza, Chicago 1, Ill. This bulletin is of great value to engineers who are designing settling tanks. Check the reply card.

Vitrified Clay Floor System For Trickling Filters

452. The IMCO two unit floor is noted for its mechanical strength, simplicity of construction and large percentage openings for aeration. The units are self spacing and easily set in place. Check the reply card or write Industrial Materials Co., Somerset St. and Trenton Ave., Philadelphia 34, Pa., for complete catalog.

Pressure Operated Sump Controls Used in Pumping Stations

525. Literature is available from Healy-Ruff Co., 2255 University Ave., St. Paul 14, Minn., describing controls used in the control of liquid level in sumps and wet wells and single and multi-pump controls for pumping stations and sewage plants. Check the reply card.

Made of malleable iron. Single massive bolt. All sizes, 1/2" to 12" inclusive. For steel, cast iron and Transite pipe.

M. B. SKINNER COMPANY

SOUTH BEND 21, INDIANA, U. S. A.

SKINNER-SEAL SERVICE SADDLE

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the reply card or write F. B. Leopold Co., Inc., Dept. PW., 227 So. Division St., Zelienople, Pa.

Catalog on Steel Grating

665. New ideas in flooring, walkways, stair treads, platforms and shelving are covered in Catalog 2527 available from Blaw-Knox Co., Dept. W., Pittsburgh 38, Pa. Check the reply card for information on choice of cross bar and bearing bar designs and spacings.

Reinforced Concrete Pipe For Culverts and Sewers

672. Elliptical Lo-Hed and Hi-Hed pipes, round pipe and flat base pipe are described fully in literature from American-Marietta Co., Concrete Products Div., 101 East Ontario St., Chicago 11, Ill. Headwall details, discharge curves, hydraulic capacity tables and hydraulic properties are included. Check the reply card.

Spiragester, A Combination Clarifier and Digester

709. A 22-page catalog is available from Lakeside Engineering Corp., 222 W. Adams, Chicago, Ill. describing the Spiragester. Check the reply card for operation of the unit, advantages, specifications, samplers and painting.

Information on Welded Wire Fabric

729. Reinforced concrete sewer and culvert pipe that are made with U.S.S. American welded wire fabric are described in literature from American Steel & Wire Div., United States Steel, Cleveland, Ohio. Check the reply card for specifications and engineering data.

•

STREETS AND HIGHWAYS

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks, streets and factory floors solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a 16 page catalog by Koehring Division, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the reply card.

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy reply card for full data. Ernest Holmes Co., Chattanooga, Tenn.

Concrete Bridge Details

58. An illustrated 48-page booklet, published by the Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill., calls attention to good and poor practice in bridge building. It also shows how to improve improper details and open the way for use of higher stresses. Write to PCA for your copy or check the reply card.

How to Get Better Concrete Construction

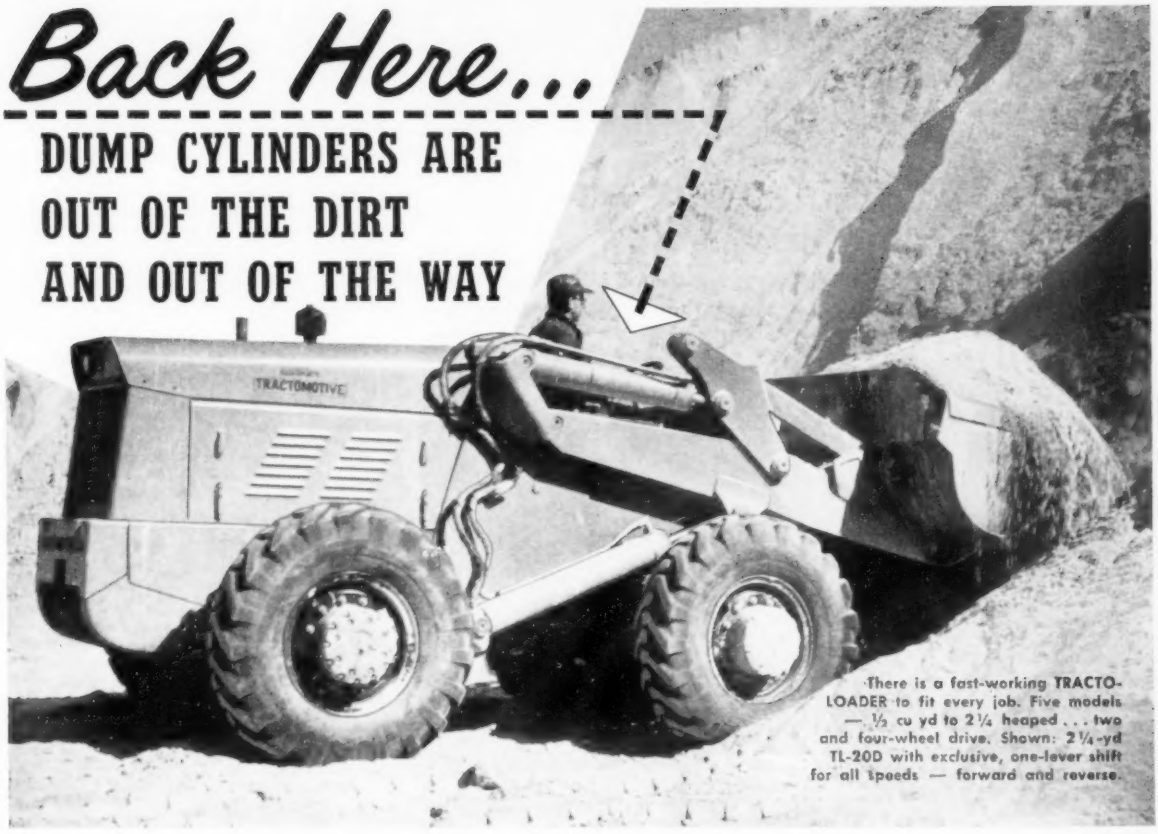
93. A report on the use of "Pozzolith" as a means of increasing the strength and durability and reducing the permeability of concrete structures, while reducing costs at the same time, is presented by Master Builders Co., Cleveland 3, Ohio. Check the reply card today.

Non-Electric Traffic Control Products

156. Reflective pavement marking glass beads, Cataflex "202" reflective coating, Cataline reflective striping, Catatherm reflective plastic striping, plain and reflective street and highway signs, plain and reflective street name signs are covered in literature from Cataphote, Corp., P. O. Box 2066, Jackson, Miss., or by checking the reply card.

Back Here...

DUMP CYLINDERS ARE OUT OF THE DIRT AND OUT OF THE WAY



There is a fast-working TRACTO-LOADER to fit every job. Five models — ½ cu yd to 2¼ heaped . . . two and four-wheel drive. Shown: 2¼-yd TL-20D with exclusive, one-lever shift for all speeds — forward and reverse.

Another example of Tractomotive Common Sense Design Another reason why upkeep is less on TRACTOLOADERS®

Instead of attaching dump cylinders to the bucket . . . where they are always in the thick of your work . . . Tractomotive mounts its dump cylinders up and away from the ground, well back on its TRACTO-LOADERS — out of harm's way. There is little chance of dirt, sand or other abrasives entering the hydraulic system through the dump cylinders on a TRACTOLOADER. Little chance of the cylinders or rods being damaged!

Other advantages of this out-of-the-way mounting include greater loader stability . . . no extra weight to lift with bucket . . . fewer moving parts!

Tractomotive has had this common sense design ever since it started building TRACTOLOADERS years ago . . . ever since it designed the first crawler tractor loader (over 20,000 now in use).

This design difference makes an upkeep difference . . . a performance difference—and a profit difference!

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Reflective Liquid For Hydrants, Guard Rails and Culvert Walls

157. Codit reflective liquid goes on fast by brush or spray and lasts up to 2 years. Hazards flash their own bright warning at night for safety. Check the reply card or write Minnesota Mining & Mfg. Co., Dept. NR-58, St. Paul 6, Minn., for full information.

A Street Sweeper For Every Sweeping Need

158. A new catalog containing eight pages of illustrated information on street sweeping with the Mobil Sweeper, motor pickup type street sweeper, is just off the press. It is used on streets, highways, airports, parks, parking areas and other paved areas. For your copy write Mobil Sweeper Div. of the Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif., or check the reply card.

Sand and Cinder Spreaders For Streets and Highways

175. PTO with mechanical or hydraulic operation and auxiliary engine with mechanical or hydraulic operation are the choice of drives on these sand and cinder spreaders. Check the reply card or write Baughman Mfg. Co., 152 Shipman Road, Jerseyville, Ill., for complete catalog.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic sign faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Grace Sign & Mfg. Co., St. Louis 18, Mo

Davis Back-Hoe and Davis Loader

312. Literature is available from Massey-Ferguson Industrial Division, Massey-Harris-Ferguson, Inc., 1009 S. West St., Wichita, Kans., describing the new Davis backhoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors.

Information on Boring Machines

365. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit are available in new bulletin just released by Earthworm Boring Machine, Inc., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included.

Sign Catalog Has Latest Spacifications

417. Detailed information on all classifications of standard signs for traffic control, street identification and other purposes together with a complete line of accessories is presented in a convenient Sign Manual by Lyle Signs, Inc., 2731 University Ave. S. E., Minneapolis 14, Minn. Get Catalog B-55 for most recent data and specifications on U. S. Standard signs.

4-Wheel Drive Tractor Loaders

434. A 16-page Catalog, No. 1033-5-57, describing the "Tracto-Loader Line" of front end wheel loaders is available from Tractomotive Corp., Deerfield, Ill. Covered are the five models that are in production.

IHC Crawler Tractors For Highway Construction

491. Information on the new International TD-6, TD-9, TD-14 and TD-18 diesel crawler tractors is contained in 8-page, 2-color booklets available from Consumer Relations Dept., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Mechanical features and specifications, engine power, and operation are fully covered.

Ultra-Clean Sweeping For Streets, Yards and Airports

499. A new approach to extra-clean sweeping is described in a 4-page illustrated Bulletin (No. 85.55) issued by the G. H. Tennant Co., 755 N. Lilac Drive, Minneapolis 22, Minn. Described is a 7'4" path sweeper that eliminates the use of water for dust control. Check the reply card.

To order these helpful booklets check the reply card opposite page 18.

Snow Plows For Snow Control

539. V-type one-way and reversible plows with hydraulic hoist and having a plowing width of up to 9½ ft. are described in literature from Gledhill Road Machinery Co., Galion, Ohio. For models, specifications and features check the reply card.

Vacuum Cleaner and Leaf Collector For Cleaner Streets

595. A unit is now available that can be mounted on a right-hand drive jeep or a pick-up truck for picking up gutter trash and leaves. Complete specifications, capacity, operation and installation procedures are covered in a bulletin available from Tarrant Mfg. Co., Saratoga Springs, N. Y., or can be obtained by checking the reply card.

Warn Lock-O-Matic Hubs Manual

618. Warn Hubs make 4-wheel drive more useful, because they make it into a "free-wheeling" 2-wheel drive, as well as a 4-wheel drive. The Lock-O-matic hubs reduce front end wear, engine load and gear whine. Check the reply card or write Warn Mfg. Co., Riverton Box 6064, Seattle 88, Wash.

Crezon Plywood Signs Have Long Life Expectancy

641. Crezon overlaid plywood signs are described fully in literature available from Crown Zellerbach, San Francisco 19, Calif. Material is strong and rigid, resists bending or tearing loose from the pole and there's neither checking nor blistering from heat or freezes.

Catalog on Road Rollers and Compaction Equipment

667. Two and 3-axle tandem rollers, 3-wheel variable weight rollers and the Kompactor are covered in this catalog from Buffalo-Springfield Roller Co., Springfield, Ohio. Specifications, models and features are included. Check the reply card today.

For Prompt Service Use The Reply Card

Construction Guide For Engineers and Builders

669. A 34-page four sectioned construction guide containing full-page structural drawings that provide basic information on types, grades and applications of fir plywood for engineers and builders has been released by Douglas Fir Plywood Association, Tacoma 2, Wash. Check the reply card for data on floor construction, single and double wall construction and roof construction.

Reflective Pavement Marking

685. Centerlite reflective compound has the beads already in the mixture and you apply the stripe in one pass on the pavement. Check the reply card or write Minnesota Mining & Mfg. Co., Dept. QV-28, St. Paul 6, Minn., for full details.

Literature on Reflective Glass Beads

690. Glass beads for traffic signs and street name signs are described in literature available from Flex-O-Lite Mfg. Corp., 8305 Flex-O-Lite Drive, P. O. Box 3066 (Afton Br.), St. Louis 23, Mo. Beads can be used on white and yellow signs. Check the reply card.

Complete Line of Traffic Signals and Control Equipment

721. Econolite has acquired the General Electric line of traffic signals and control equipment and has available literature on types, models and specifications. Write Econolite, 8900 Bellanca Ave., Los Angeles 45, Calif., or check the reply card.

Catalog on All Phases of Brush Disposal

771. This informative 2-color catalog gives complete detailed information on Fitchburg Chippers, and includes drawings, specifications, diagrams and charts. Check the reply card or write Fitchburg Engineering Corp., Fitchburg, Mass., today.

To order these helpful booklets check the reply card opposite page 18.

CONSTRUCTION EQUIPMENT AND MATERIALS

Self-Propelled, One Man Operated Hydra-Hammer

85. This unit breaks concrete pavement, tamps backfill, tamps rock or heavy aggregate, cuts asphalt, compacts blacktop patches and drives highway guard rail posts. Check the reply card or write Ottawa Steel Div., Young Spring and Wire Corp., Ottawa, Kans., for complete literature.

Inexpensive Ditcher Handles Heavy Diggings

91. The Shawnee Scout Ditcher, a heavier model for extensive digging, has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas.

Diesel Powered Crawler Tractor

92. A 14-page catalog (MS-1251) from the Construction Machinery Div., Allis Chalmers Mfg. Co., Milwaukee, Wisc., covers the HD-6 diesel powered crawler tractor. Check the reply card for graphs and charts, catalog views of the tractor's principal components and a cutaway view of the entire tractor.

Useful Attachments for "Payloader" Tractor Shovels

95. Increased versatility for Hough "Payloader" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc.

Complete Line of Concrete Gunning Equipment

208. A 16-page catalog that gives complete details, specifications and operating capacities of concrete gunning equipment and answers to many of the questions asked about air placed or gunned concrete is available from Air Placement Equipment Co., 1009-11 West 24th Street, Kansas City 8, Mo. Also included are several pages of actual job application photographs showing the many and varied uses of this modern equipment.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer.

Drilling Machine For Concrete

221. The Truco diamond drilling machine is described in literature available from Truco Swivel Div., Wheel Trueing Tool Co., 15-3200 W. Davison Ave., Detroit 38, Mich. Unit will cut reinforced or plain concrete. Check the reply card.

Utility Tractor For Construction and Maintenance

232. Bulletin CR-1333-G describes the performance and handling ease of the International 350 utility tractor. Advantages, special features and specifications are included. Check the reply card or write Construction Equipment Div., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Trenching Equipment Data Conveniently Assembled

212. The entire line of Cleveland trenching and backfilling equipment is now covered in a single bulletin, with material arranged for quick comparison of capacities, specifications and dimensions of all models. Twenty-four action photos graphically illustrate various job applications. Get Bulletin S-120 now for easy review of your trenching equipment needs. Just check the reply card or write to the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

High Capacity Continuous Mix Asphalt Plants

334. A 34-page, 3-color catalog describes all of the components of Barber-Greene's Model 848 continuous-mix asphalt plant. Check the reply card or write Barber Greene Co., Aurora, Ill., for information on the mixer, several varieties of dryers, dust collectors, elevators and bins.

Agent For Improving Adhesion Between Old and New Concrete

530. Thorobond liquid bonding agent for improving adhesion of new concrete to old concrete walls, floors and ceilings is described in literature available from Standard Dry Wall Products, Inc., New Eagle, Pa. Check the reply card for information on typical uses and methods of application.

Complete Line of Asphalt Patching Mixers

586. Mixers capable of mixing 3 to 20 tons of hot mix per hour are described in literature available from McConnaughay Mixers, Inc., Lafayette, Ind. Check the reply card for full information on patching, repairing, resurfacing and sealing.

Slide Rule PS1 Calculator For Concrete

713. A new pocket size slide rule calculator for the testing of concrete in compression is available from Forney's Inc., P.O. Box 310, New Castle, Pa. It is designed to convert instantly the pressure applied to concrete cylinders and blocks into psi.

REFUSE COLLECTION AND DISPOSAL

New Roto-Pac Features Speed Refuse Collection

50. Features of the Roto-Pac refuse collection unit, which include automatic continuous loading and packing, with increased power to provide for larger loads in the same size body, are described in bulletins issued by City Tank Corp., 53-09 97th Pl., Corona, L. I. Check the reply card now to learn how your collection problems can be eased.

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a soluition, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check reply card or write Gar Wood Industries, Inc., Wayne, Mich.

Developments in Refuse Collection

119. The "Dempster-Dumpmaster" system for refuse collection combines the advantages of detachable containers for bulk collection, convenient front-end loading and compaction in a sealed body. Be sure to investigate the application of this system to your collection needs. Complete data offered by Dempster Bros., Knoxville 7, Tenn. Check the reply card today.

Refuse and Garbage Packer Bodies

241. Ranging in capacity from 12 to 24 cu. yds., the M-B packers have a 30 second compaction cycle and have large side loading doors. Write M-B Corp., New Holstein, Wisc., or check the reply card for bulletin on specifications.

Planning A Sanitary Landfill

287. Covered in this manual is how to work various types of terrain efficiently for sanitary landfills. Swampy land, river bottom land, gravel pits, strip mines, and flat land operation are the sections. Write to Caterpillar Tractor Co., Peoria, Ill., or check the reply card for your copy.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 15, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

Complete Package Dravo Incinerator Plant

584. The Dravo incinerator includes automatic refuse handling system, combustion controls, water wall furnace, stoker, ash disposal system, flue gas scrubber and everything necessary for the efficient operation of the plant with minimum personnel. Write for full information to Dravo Corp., Dravo Building, Pittsburgh 22, Pa., or check the reply card.

Data on Refuse Collection Bodies

615. The Hydro E-Z Pack compacting unit has only 2 working parts—a high volume roller bearing pump and a double-acting telescopic cylinder. A refuse-crushing compacting pressure of 82,500 lbs. is attained in the units. Write Hydro E-Z Pack Co., Galion, O., or check the reply card for complete specifications.

Modern Methods in Sanitary Landfills

699. Up-to-date data, pictures and explanation of sanitary landfill, its methods and equipment are covered in this valuable bulletin from The Oliver Corp., 19300 Euclid Ave., Cleveland 17, O. Check the reply card for information on satisfactory garbage and refuse disposal methods.

STREET LIGHTING AND TRAFFIC CONTROL

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy reply card. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Get Full Data On the Radar Speed Meter

22. Accurate readings of vehicle speeds, with direct indications in miles per hour and a graphic recorder for permanent record are available by use of the Electro-Matic Radar speed meter, a product of Automatic Signal Division, Eastern Industries Inc., Norwalk, Conn. For full data on this device, just check the reply card.

Residential Street Lighting

228. A new 16-page bulletin on residential street lighting is now available from the General Electric Co., Schenectady 5, N. Y. Well illustrated, the bulletin, designated GEA-6316, explains how good lighting benefits a residential community and provides information on how to plan modern residential lighting installations.

Valuable New Floodlighting Catalog

403. A 16-page catalog containing information on tapered steel and aluminum Monotube floodlighting poles designed for use in lighting outdoor sports activities, commercial and industrial areas and parking lots, has just been issued by the Union Metal Mfg. Co., Canton 5, Ohio. Easy-to-read diagrams, illustrations and applications are included. Check the reply card.

RECREATION

How to Equip Your Parks and Playgrounds

414. A handsome 60-page illustrated catalog showing a full line of extra heavy duty playground, park picnic and dressing room equipment, plus many related items, is now available from American Playground Device Co., Anderson, Ind. Complete specifications, construction features, prices and details of labor and materials needed for installation are included. Check the reply card.

Rubberized Playground Surfacing Material

668. Saf-Pla can be applied to black top, concrete or properly surfaced areas to reduce injuries from children falling. Check the reply card or write to U. S. Rubber Reclaiming Co., Inc., Box 365, Buffalo 5, N. Y.

WEED AND DUST CONTROL

How to Stop Bothersome Dust

433. A bulletin that covers the use of calcium chloride in the control of dust is available from Wyandotte Chemicals Corp., Michigan Alkali Div., Wyandotte, Mich. Tables on the use of calcium chloride psy are included. Check the reply card.

6 Wells Drilled in Residential Streets!

BJ Submersible Pumps solved a tough water problem recently in Owensboro, Ky. Six deep wells were drilled in residential streets and a 20 HP Type H Submersible unit was installed in each well. Starters and automatic control systems were mounted on adjacent telephone poles. By including Byron Jackson well seals, the units were flood-proofed and safe from weather extremes and vandalism.

Since the units were installed beneath the public streets, no tax money was spent for costly real estate or involved rights-of-way. No pump houses were necessary. Entirely silent in operation, the units cannot be seen, heard or felt. The pump pits are easily accessible through ordinary manhole covers. One man, at a remote panel located in the Municipal Utilities Building, controls the entire operation. Owensboro's modern water system now includes nine BJ Submersible well installations.

Advantages of the BJ Submersible

- No Pump House required — valuable surface space not obstructed
- Unaffected by floods or weather conditions
- Safe from vandalism
- Operates completely submerged at any depth
- Always primed and free from suction troubles
- Silent performance — can't be seen, heard or felt
- Adaptable to crooked wells, lowering water tables
- Years of automatic, unattended operation

FINISHED BJ SUBMERSIBLE INSTALLATION Above is pump pit with BJ Submersible in place. No elevated structures take up valuable space or mar appearance of area. Silent and vibrationless in operation, unit cannot disturb residents. Pump pit is easily accessible through manhole cover. Starter and automatic control system are located on telephone pole. Note simplicity and resultant economies of installation.

ELMER SMITH, Superintendent of Owensboro Municipal Utilities Department, is head of city's modern water supply system, which now includes 9 BJ Submersible well installations.

SINCE BJ 1872

Byron Jackson Pumps
INC.
A SUBSIDIARY OF BORG-WARNER CORPORATION
P. O. BOX 70 • LAWRENCEBURG, INDIANA

HERE'S ASSURANCE

that your concrete pipe is the strongest possible!

ANY CONCRETE PIPE that is reinforced with welded wire fabric is going to be stronger, more permanent, and easier to maintain than non-reinforced pipe.

BUT TO BE SURE of the *maximum possible* benefits from reinforcement, see that your pipe is reinforced with USS AMERICAN WELDED WIRE FABRIC. American Welded Wire Fabric is precision-made from quality cold-drawn steel wires. The quality of the steel . . . the dependability of the welds . . . the accuracy of wire spacing are all closely controlled to assure you of top performance.

You can get USS American Welded Wire Fabric in the right size and style for any type of sewer or culvert. It comes in circumferential wire sizes up to ½" at 2", 3", and 4" on centers. Write or call for complete information.

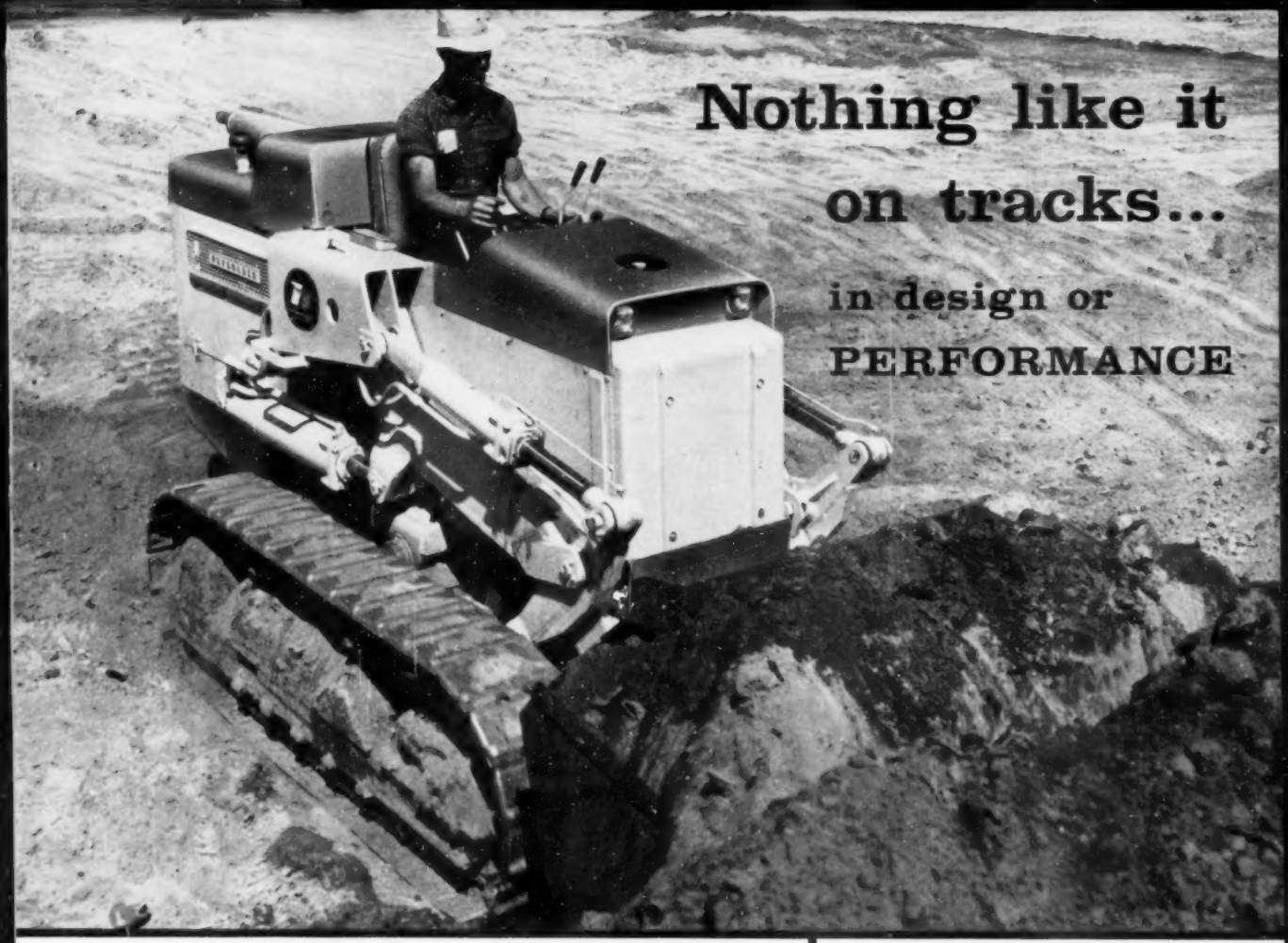
REMEMBER, IT PAYS TO ASK

"is it Reinforced"

American Steel & Wire
Division of
United States Steel

USS

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad



Nothing like it on tracks...

in design or PERFORMANCE

model 12 PAYLOADER®

Years of Hough development and testing bring you this model 12 "PAYLOADER" that is years ahead of the field. It's the first built-as-a-unit tractor-shovel, completely designed for shovel work instead of a tractor attachment. It outperforms much larger units and is a driver's dream in ease-of-operation, easy riding, visibility and safety.

BALANCE Engine-at-rear is the basic difference. It spreads the weight of the machine and load over the entire track lengths instead of concentrating it on the front idlers. Result — more traction for digging, more stability for faster carrying, smoother riding, less track maintenance . . . PLUS the ability to work in soft spots where others would bog down.

SPEED Power-shift transmission and power-steer permit instant on-the-go shifting and steering that is fast and almost effortless. There's no pulling and pushing, no foot brakes. There is instant response and speeds up to 10 mph forward *and* reverse.

VISIBILITY Driver is comfortably seated up front where he can see what his bucket is doing and where he is going. He is also spared the bouncing action of conventional rear-seated locations.

For tractor-shovel performance and ease of handling like you've never seen before, ask your Hough Distributor about the model 12 "PAYLOADER". Ask him about Hough Purchase and Lease Plans too.

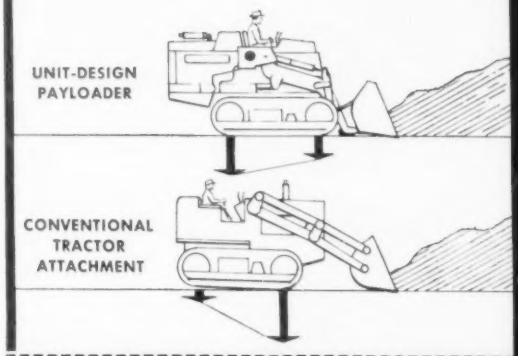
Modern Materials Handling Equipment

THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Rear engine mounting distributes weight over entire track length . . . gives you more traction and stability for digging, carrying and dumping.



THE FRANK G. HOUGH CO.

761 Sunnyside Ave., Libertyville, Ill.

Please send more information on the outstanding 1¾ cu. yd. model 12 "PAYLOADER"

Name _____

Title _____

Company _____

Street _____

City _____ State _____

Kansas City, Missouri

the perfect setting for...

AMERICAN PUBLIC WORKS ASSOCIATION

PUBLIC WORKS CONGRESS AND *Equipment Show*

September 28 - October 1, 1958

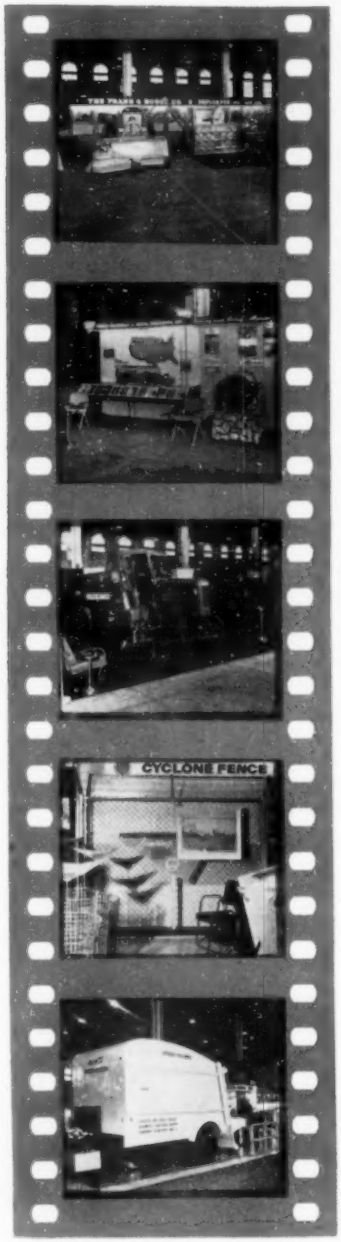
We are highly honored to have the APWA hold its 1958 Public Works Congress and Equipment Show in Kansas City. The Local Committee, together with the officers and staff of our Association, is going all-out to make this a very worthwhile meeting for all persons concerned with public works activities.

Plan now to attend. We will certainly look forward to seeing you and assure you that everything will be done to make your trip a very profitable and enjoyable experience.

Sincerely yours,

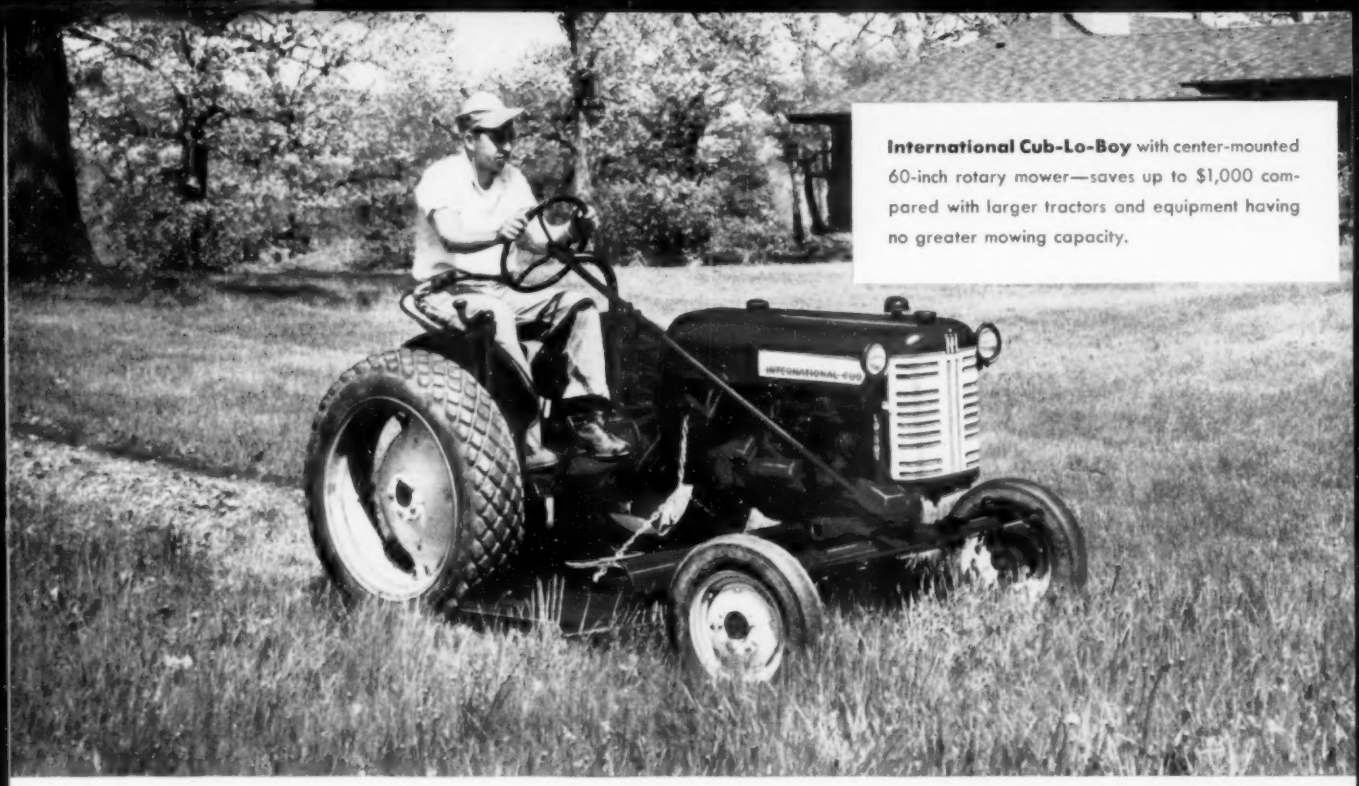
Reed McKinley

Reed McKinley, Director of Public Works Kansas City, Mo., and General Chairman 1958 Public Works Congress & Equipment Show



AMERICAN PUBLIC WORKS ASSOCIATION

General Offices: 1313 E. 60th Street, Chicago 37, Illinois Phone FAirfax 4-3400



International Cub-Lo-Boy with center-mounted 60-inch rotary mower—saves up to $1,000 compared with larger tractors and equipment having no greater mowing capacity.

With International® power, you can specify any of 66 tractor-mower combinations!

Fine turf, tall grass, rank weeds—for any type mowing of any size area, you can meet your mowing specifications exactly with an International* tractor. Seven tractor models, ranging from 10 to 45 hp, let you avoid both under-powering and over-powering. Then, match your size of tractor to any of four mower types, in a wide range of sizes . . . there are 66 tractor-mower combinations from which to select! The table below makes it easy to analyze the best combination for your specific needs—and stay within your budget.

ONLY YOUR IH DEALER PROVIDES THIS WIDE SELECTION

From the low-cost, 10 hp International Cub*-Lo-Boy*, to the rugged, 45 hp 350 Utility, your IH Dealer offers the industry's most complete line of tractors for mowing and other park and municipal needs. Equally important, he stands back of the equipment he sells with parts and service facilities *unequaled anywhere!*

INTERNATIONAL TRACTOR MODELS	BELT HP	MOWER TYPES AND SIZES			
		CUTTER BAR	ROTARY	HAMMER KNIFE	GANG REEL
Cub Lo-Boy	10.8	5-ft (S)	(C) 42, 60-in. (R)	(S) 48-in. (R)	(C) (S) 3-gang (R) (T)
Farmall Cub	10.8	5-ft (S)	(C) 42, 60-in. (R)	(C) 48-in. (R)	(C) (S) 3-gang (R) (T)
I-130	23.1	5, 6, 7 ft (S)	(C) 42, 46-in. (R)	48-in. (C) 60-in. (R)	5-gang (T)
F-230	29.2	5, 6, 7 ft (R)	54-in. (C)	60, 72-in. (R)	
I-330 Utility	35.2	(S) 5, 6, 7 ft (R)	61-in. (R)	60, 72-in. (R)	7-gang (T)
*I-350 Utility	44.9	(S) 5, 6, 7 ft (R)	61, 80-in. (R)	60, 72-in. (R)	5-gang (C, R) 7-9-gang (T)
*F-350	42.4	5, 6, 7 ft (R)	94-in. (C)		

(C) Center-mounted (R) Rear-mounted Fast-Hitch (S) Side-mounted (T) Trailing *Diesel, LPG models available

Your IH Dealer will demonstrate! Look in the classified directory, phone today for a convenient date.

SEE YOUR

INTERNATIONAL HARVESTER DEALER

International Harvester Products ***pay for themselves in use***—Farm Tractors and Equipment . . . Twine . . . Commercial Wheel Tractors . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois.

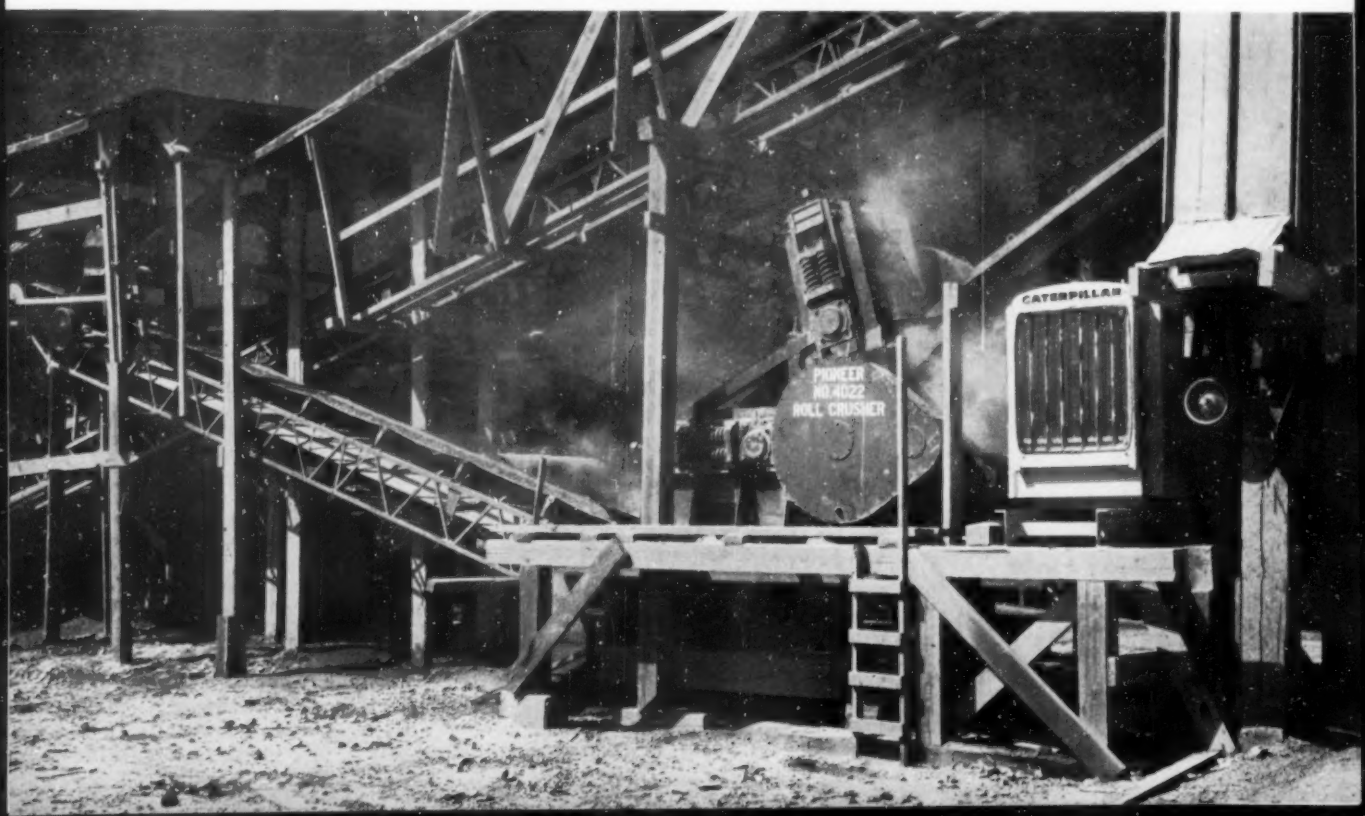
"We've found we can depend dust or rain, it's all

This statement by M. L. Phelps, road supervisor of Cowlitz County, Washington, is typical of the way county and city commissioners feel about dependable CAT Diesel Engines

Mr. Phelps, road supervisor of District No. 1 of Cowlitz County, purchased his Cat D337 on low bid to drive a crusher and power screens at the county gravel pit. The county, which has found Caterpillar equipment the best tax-money buy from way back, also uses a Cat D8800 to run a breaker and intermittent feeder. County and municipal governments from coast to coast are finding that with durable Cat Diesel power, you get low-cost dollars-per-hour operation over the long haul. And this adds up to the best buy for taxpayers.

For powering and repowering, Caterpillar has the most economical and trouble-free diesel engines for any application. Your Caterpillar Dealer stocks a wide variety of engines and electric sets and his fast service and repair facilities are without equal. Engine durability is built in through the use of superior metals and skilled workmanship. You get good torque rise as the engines lug for smooth handling of rapidly varying loads.

Road District No. 1 of Cowlitz County, Washington, bought this Caterpillar D337 on low bid to drive the Pioneer triple roll crusher and furnish power for two screens on operations northeast of Kalama, Washington. Road Supervisor M. L. Phelps (inset) says that Cowlitz County has used Caterpillar equipment since the early days — it's the best. The extra protection afforded by the oil filter of this rugged Cat Engine removes harmful, microscopic abrasive particles.



on Caterpillar power–
the same to us!"

Note the following features—two of many which account for so many local governments specifying *Cat power* when they want to *prove* a wise investment to the taxpayer:

To give long periods between overhauls and for smooth operation, Cat pistons are balanced within close tolerances. Cast-iron bands support the top rings to give extra strength to the aluminum alloy pistons, and all rings are chrome-faced for better scuff resistance to give longer wear.

Multi-Featured Piston Assembly

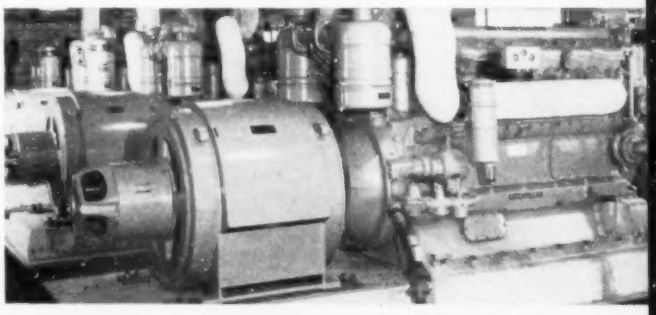
Seven large aluminum alloy bearings support the crankshaft. These precision-type bearings were pioneered by Caterpillar to give you extra-long engine operation. Typical of the extra durability Caterpillar Tractor Co. puts into its engines is the thin coating of tin on each bearing to assure you of proper bearing break-in for better performance throughout the engine's life.

Aluminum Alloy Bearings for Less Down Time

Call your Caterpillar Dealer today. He is well known in your community, can help with installation problems, and will be glad to submit a realistic bid on your power needs. He's as near as your telephone and anxious to help.

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

The Yuma County Water Users' Association of Yuma, Arizona, purchased this durable Cat D318 Engine to power a Bay City dragline, shown cleaning irrigation ditch south of Yuma. The county also uses a Cat D6 Tractor with No. 6S Bulldozer on the job. Cat-built equipment keeps going on the job to give taxpayers a low final cost for their purchasing dollars.



In New England tradition, Barton, Vermont, called a town meeting at which 94% of those attending voted for installation of a new diesel plant (by Caterpillar, of course)—4 Cat D397 Electric Sets to supply full electric power for the community.

ENGINE POWER
BY CATERPILLAR

Dept. PW6, Engine Division
CATERPILLAR TRACTOR CO., Peoria, Illinois, U.S.A.

Send me more information about Cat Engines and Electric Sets showing how their purchase would save the taxpayer money.

☐ Have your dealer call for an appointment, as I may be in the market for a Cat Diesel Engine. I understand that I am under no obligation.

☐ I am interested in learning more in general about these engines.

Name_____

Government Department_____

Address_____

City_____ Zone____ State_____

Dodson's Digest

Repeat Performance

Jim Foster, who recently retired as a county road supervisor, bought a small airport to combine his "leisure" with his hobby of flying.

My chance to look over his new set-up came just a few weekends ago. Naturally, we reminisced a bit.

"Remember when you used to buy Calcium Chloride for your roads as if you were trying to corner the market, Jim?" I asked.

He nodded . . . then quickly replied, "Yeah, but I was a pushover for the first sale. It was only coincidence that you happened by just as I was going to call in my first order!"

"G'wan," I laughed. "I suggested Calcium Chloride for dust control, and I remember your words to this day: 'Can't afford it. Besides, I'm surfacing this summer!'"

"After that you didn't hear a peep out of me!" Jim emphasized.

"No reason for any," I reminded him. "Not only did you eliminate dust, but you had a more stable base when you started paving. And you got more work done sooner at lower cost because I saved you money all along the . . ."

"Enough of this chitchat, Dodson," he grinned. "C'mon! Let's take a spin into the wild blue as long as you're here."

We got into a plane and taxied around to a neat, gravel runway. As we approached, another small plane throttled into its takeoff . . . enveloping us in a cloud of dust.

We looked at each other, and I said, "Jim, I'd like to take just a few minutes of your time to point out the merits of Calcium Chloride for dustproofing!"

"Can't afford it," he laughed. "Besides, I'm surfacing this summer!"

— L. D. Dodson

P.S.—For complete information on how *you* can "ground" dust with Wyandotte Calcium Chloride, write me for a free copy of our leaflet, "How To Stop Bothersome Dust." *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Bidding Problems

National Engineering & Contracting Co. v. The City of Cleveland, 146 N.E. (2d) 340, an Ohio case decided Aug. 12, 1957, was a taxpayer's action to enjoin the City of Cleveland from executing a contract for the construction of a city incinerator, because of irregularities in the bidding procedure.

In June of 1956, the City of Cleveland adopted an ordinance containing the following language:

"By Mayor Celebreeze.

"An emergency ordinance determining the method of making the public improvement of the construction of incinerator . . . by contract duly let to the lowest responsible bidder after competitive bidding for a gross price."

Subsequent to the passage of the ordinance, the City issued an Invitation to Bid containing Special Notice to Bidders, General Conditions, and bid forms for the construction of the incinerator plant. The specifications required that the bids be accompanied by appropriate data, sketches, drawings, sales specifications, etc., so that a true and thorough analysis of the bid could be made.

When the bids were received, only one of them contained such information. The Board of Control of the City of Cleveland then proceeded to determine which was the lowest responsible bidder, and awarded the contract to the Hunkin-Conkey Construction Co., which had not initially supplied the required information. Prior to making this award, but after the bids had been opened, the Hunkin-Conkey Construction Co. had supplied the required information and it had been considered by the engineers of the City of Cleveland and the Board of Control.

The court held that it was improper to insert such material into the envelope containing the bid after the opening of the sealed bids, since this material substantially affected the amount of the bid, and it thus gave an advantage to such bidder not allowed to others. This was a substantial variation from the specifications, and the City was permanently enjoined from accepting such bid.

Up in Smoke

Airplanes are supposed to go up,—but not in smoke. However, in Wren v. City of Corsicana, the unexpected happened. A city employee was burning grass on the city airport, but he didn't stop burning until he had also burned up the airport's hangar and the plaintiff's airplanes.

The plaintiff, who was "burned up" only figuratively, brought suit against the city for the damages caused by the negligence of its employee.

The city's defense was that maintaining the airport was a governmental activity. The court, however, held that it was a proprietary activity, for which the city had no immunity.

This is in accordance with the weight of authority.

Dumping and Burning

Neubauer v. The City of Cleveland, 146 N.E. (2d) 641, an Ohio case decided Dec. 23, 1957, was an action against the City of Cleveland to abate a nuisance of combustible waste burning on the lake front.

An injunction had been granted earlier, prohibiting the City from dumping combustible waste materials of commercial origin at the site of the Cleveland Lakefront Dump. The City now asked for a temporary suspension of the injunction.

The City promised not to do any more burning on the site, but maintained that it was necessary to con-

it's NEW! the Ottawa BACKHOE now mounts on the CHEVROLET TRUCK!

WITH NEW IMPORTANT FEATURES!

• Digs 12½ feet deep • Has 190° continuous swing • Turret-type seat pivots with boom • Reverse-mounted cylinders place rods up safely from rocks and dirt • Rod-fed cylinders do away with exposed hydraulic lines • "Bite" has 7,000 lb. force at bucket edge • Two levers (dual "One-Trols") control all backhoe actions • Ejector bucket automatically forces all wet sticky material from bucket • Hydraulic laydown shifts backhoe up and over rear axle for perfect roadability • Quick on-and-off frees truck for other work in minutes!

WORK MANY JOBS — IN DIFFERENT AREAS — THE SAME DAY!

The Ottawa Truck-Mounted Backhoe is designed to meet the need of public utilities, plumbers and contractors for a COMPLETELY MOBILE DIGGER! It's an UNBEATABLE COMBINATION for

MUSCLE! The powerful hydraulic system of the Ottawa "Big Muscle" Backhoe provides EXTRA POWER for fast, smooth, economical operation!

MOBILITY! Use it anywhere, anytime . . . one job or several jobs at different locations during one day! The Ottawa WORKING UNIT is also the MOBILE UNIT ready to move anywhere with great roadability, ready for operation seconds after arrival at a new jobsite!

VERSATILITY! Dig trenches and ditches faster . . . load dirt direct from trench to truck . . . dig square graves that need no hand finishing . . . dig and maintain irrigation channels . . . clean roadside drainage ditches . . . dig building footings and septic tanks . . . use as a boom to lay lightweight pipe . . . the Ottawa Backhoe is COMPLETELY MOBILE to your needs!

Ottawa

OTTAWA STEEL DIVISION
Young Spring & Wire Corp.
Ottawa, Kansas

BUY the Ottawa BACKHOE and the Chevrolet TRUCK! GET the BEST BENEFITS of each . . . PLUS . . . the NEW, DYNAMIC ADVANTAGES of the COMBINATION TRUCK-BACKHOE!

AVAILABLE ONLY AT YOUR CHEVROLET TRUCK DEALERS!

tinue the dumping temporarily until another site could be obtained. It promised to use the sanitary fill method pending the procurement of such other site.

The request for the suspension of the injunction was based on the statement that otherwise "an emergency will arise seriously affecting the health and welfare of the community by reason of fire and health hazards due to the accumulation of such combustible waste", particularly through the Christmas season.

The judge respected the Christmas spirit, and granted the temporary suspension.

Water, Water, Everywhere

Taylor v. City of Devil's Lake, 87 N.W. (2d) 401, a North Dakota case decided Jan. 30, 1958, was an action by the owners of a hardware store against a municipality for damages resulting from a broken water main.

The water main broke in front of plaintiff's place of business, permitting the water to seep through the ground into the plaintiff's basement, damaging and destroying a large quantity of merchandise stored there. The complaint alleged that notwithstanding the plaintiffs gave due and timely notice to the city and its officers of the break in the water main, the city negligently failed to shut the valves to stop the flow of water.

The city's defense was that it was immune from liability, because supplying water is a governmental function.

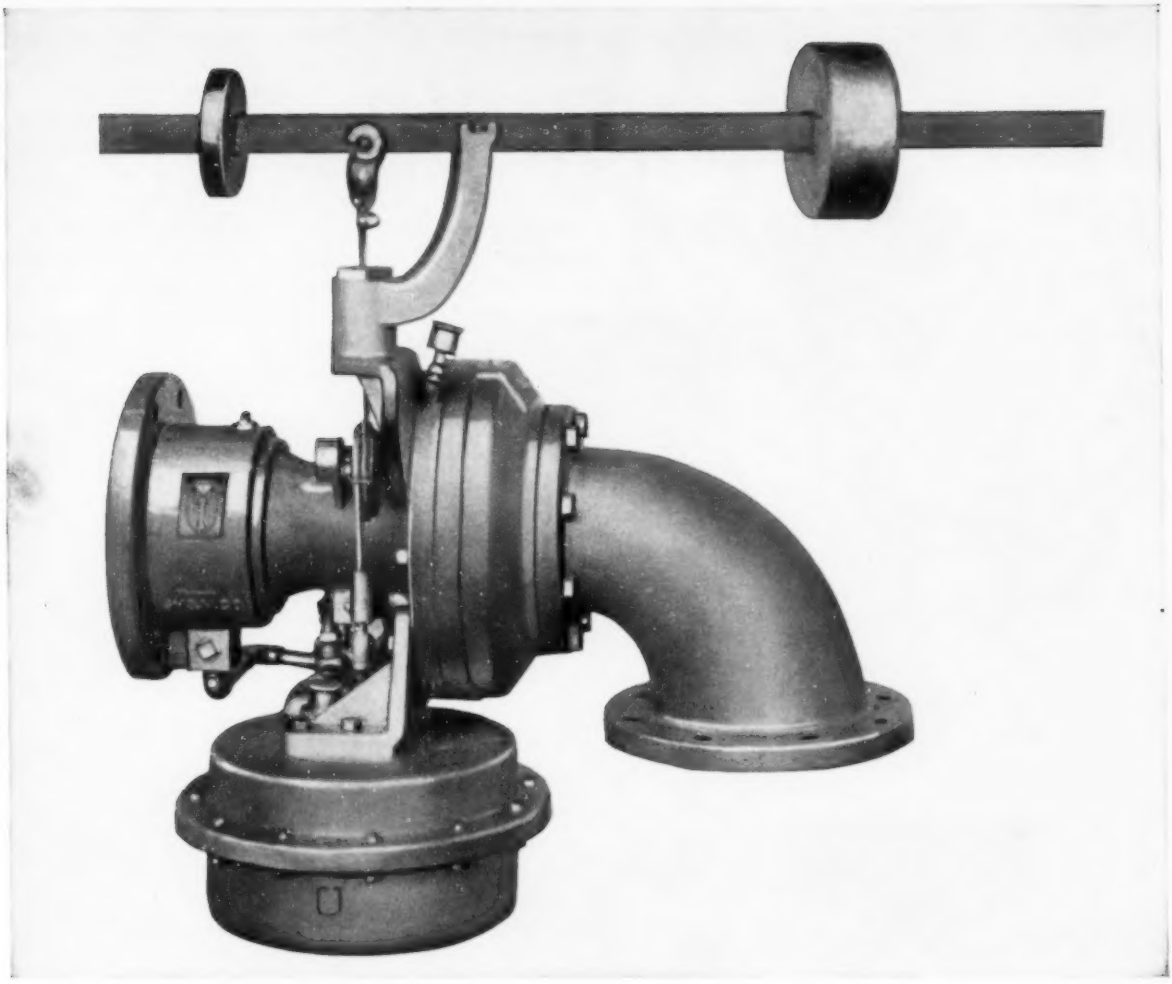
The court held that this *was* a governmental function, and that the city was therefore immune from liability for its negligence in this connection.

There is a split of authority among the various jurisdictions on this point. The majority view is *contrary* to the above holding. That is to say, under the majority view, supplying water is a *proprietary* function, giving the municipality no immunity from liability for its negligence. A recent case directly in point, in which a city was held liable when a municipal water system flooded a person's premises, is Foust v. City of Oklahoma (1954), 79 S.E. (2d) 519.

• • •

Packer Type Truck Saves Man-Hours

Purchase of a 16-yard packer-type refuse collection truck by Athens, Ala., is reported to save 12 man-hours a day labor and to reduce street littering.



Direct-acting!

SIMPLEX "S" CONTROLLERS

keep filter rate uniform without outside power sources

Important? Yes! Because it eliminates the danger of run-away filters when power sources fail. In addition, you get continuing accurate control to the wide-open position . . . for longer runs. You save on pumping with full-area opening . . . and no flow obstructions at the wide-open position.

Compact Type "S" Controller is only three pipe diameters long. Fits anywhere—horizontally or vertically. Eliminates expense of straight-pipe approaches. Proven by twenty-five years' trouble-free service. And with virtually no maintenance—saves you money in the long run.

MAIL THIS COUPON TODAY! ▶

SIMPLEX®
VALVE AND METER COMPANY
A subsidiary of PFAUDLER PERMUTIT INC.
Venturi Tubes • Flumes • Meters • Gauges
Transmitters • Controllers • Tables • Air Valves

SIMPLEX VALVE & METER CO.
DEPT. PW-6, 7 East Orange St.
Lancaster, Pa.

Send me new technical bulletin 900 that gives valuable design and performance data on Filter Controllers and Master Control Systems.

NAME_____

ADDRESS_____

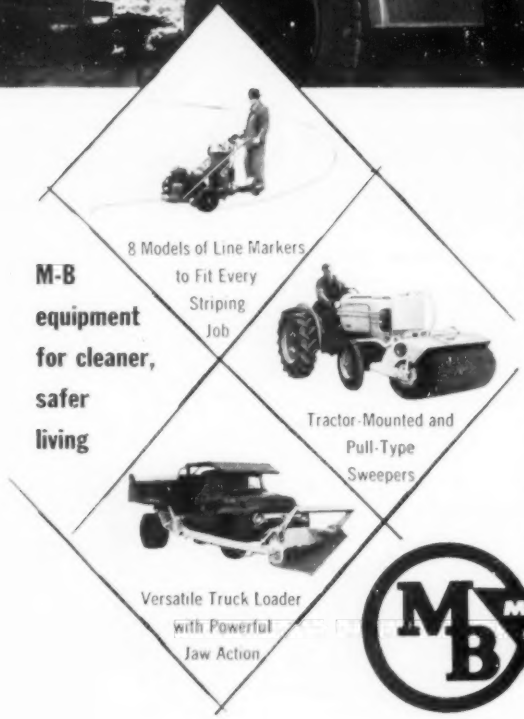
CITY_____ ZONE_____ STATE_____

packs to rated capacity ...then packs even more!

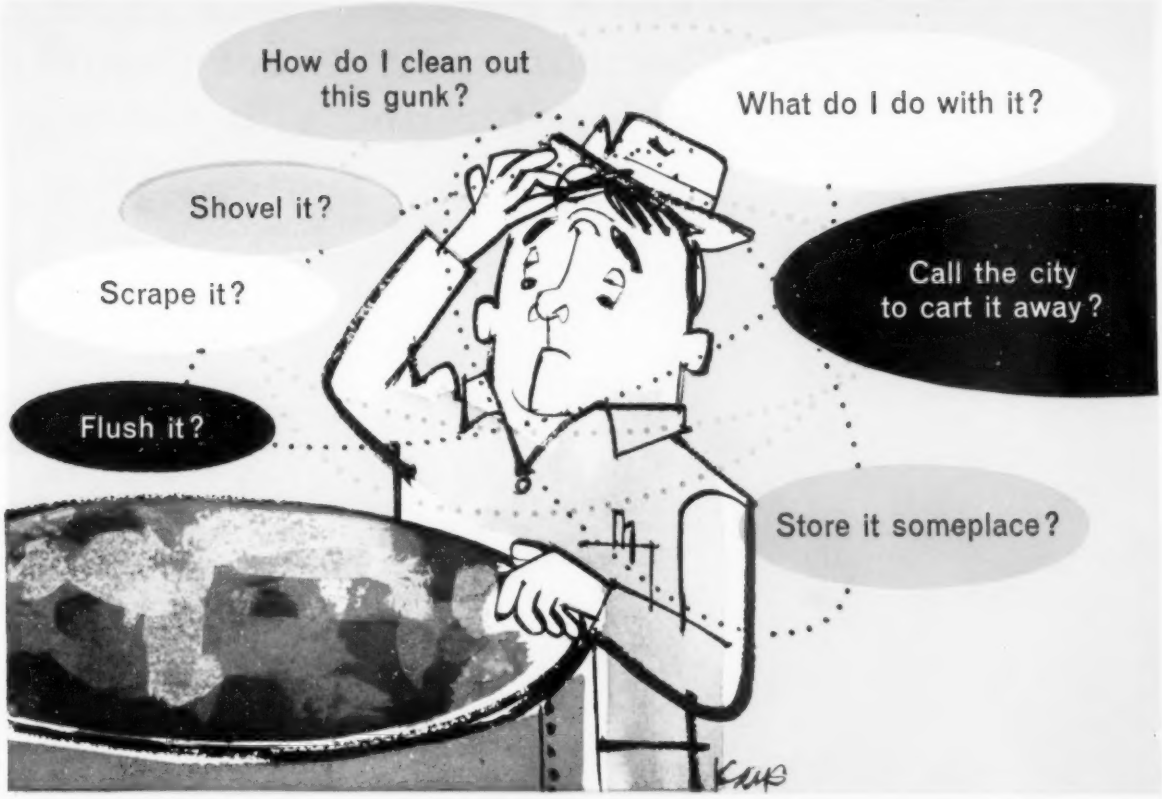
That's right! There's *bonus capacity* in every size M-B Packer Body . . . a *plus value* that gives you more route time, because of fewer trips to the dump. The secret is simple . . . simple design that allows more tons to be packed into the body than other units of the same rated capacity. ▪ The spacious, van-type body has smooth inside surfaces eliminating space-wasting voids. And nothing could be more simple . . . more effective . . . than the powerful, cable operated packer plate. The packing process is a *progressive* action . . . as the load builds up, previous loadings are compacted again and again . . . assuring the most

tightly condensed, solid load, from top to bottom, front to back. ▪ Simple design throughout, and the elimination of a heavy, complicated hydraulic tailgate, means that the packer body can be mounted on a shorter wheelbase, shorter cab-to-axle truck having a lower G.V.W. You get a body that weighs less per cubic yard of capacity . . . you haul more *payload*, less deadweight. ▪ No matter what the load . . . refuse, garbage, trash . . . M-B Packers give you this *bonus capacity* that other units just can't offer. In addition, you get more benefits like fast, safe side-door loading . . . fewer compaction cycles . . . faster, safer, cleaner dumping . . . and dozens of other job-proved advantages. ▪ Why wait any longer? Ask your helpful M-B distributor to set-up a demonstration of the low cost M-B Packer on your own routes . . . call him now!

M-B Corporation, New Holstein, Wis.



M-B CORPORATION
NEW HOLSTEIN, WIS.
MANUFACTURERS OF QUALITY MUNICIPAL AND CONSTRUCTION EQUIPMENT *since* 1907



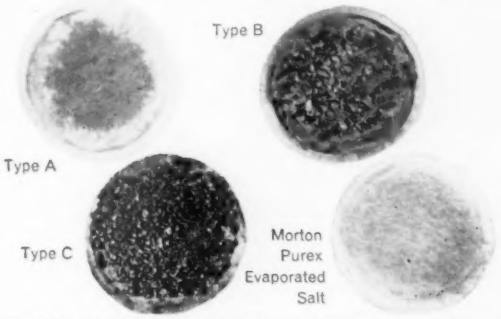
Brine tanks never need cleaning out when you use sludge-free Purex Salt

Yes, we mean never! You prevent costly shutdowns for maintenance. You save time and completely eliminate labor costs for cleaning out brine tanks. For Morton Purex Salt is 100% soluble. It will leave no accumulation of sludge—shale and sulphates—in either your brine or water-softening system.

What's more, none of your purchase price or freight bill for Purex goes toward paying for insolubles. This is an important saving, for in every 100 lbs. of ordinary salt you buy, you assume the risk of paying for up to 5 lbs. of shale and sulphates. In a 50-ton carload of ordinary salt, you may pay for as much as 5,000 lbs. of sludge. And you buy salt with "built-in" maintenance problems.

With sludge-free Morton Purex Salt, you get high-purity evaporated salt made in a controlled-particle size to prevent packing and channeling. Purex can be used in bulk wet storage systems and in the Morton Model E Brinemaker.

These filter pads (approximately 1/6 actual size) show you how much insoluble matter (sludge) you get in just 5 lbs. of various types of salt

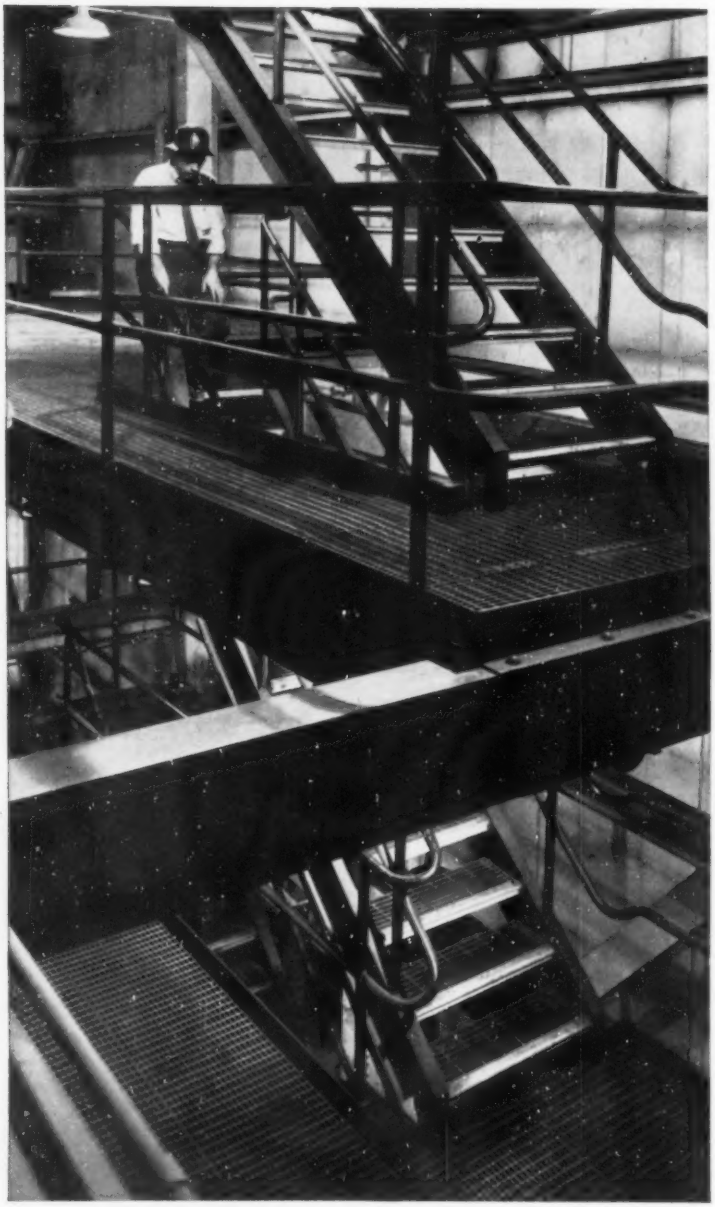


Tests for insolubles taken from these random samples show you that Morton Purex is the only one that contains no wasteful sludge or insolubles.

For more information about Morton Purex Salt and for free, expert help on any water-softening or brine-making problem, write or wire:

MORTON SALT COMPANY
INDUSTRIAL DIVISION
Dept. PW 6-58, 110 N. Wacker Drive
Chicago 6, Illinois

Where a misstep costs $500... Blaw-Knox Electroforged® Steel Grating provides safer non-slip footing



Stair falls cost industry over $60,000,000 a year.

An average accident amounts to a loss of $500 in claims.*

A good way to guard against these profit-eating accidents is to construct your stair treads, walkways and floors with Blaw-Knox Electroforged Steel Grating. Non-slip twisted crossbars and a wide variety of bearing bars are available to meet every kind of working condition—safely solving the most hazardous skid situations.

Rigid, one-piece construction makes installation easy. Once on the job, Blaw-Knox grating practically takes care of itself. There is nothing to wear, nothing to patch, no dirt collecting corners to clean. It goes anywhere, fitting neatly around pipes, beams and machinery, admitting plenty of light and air to the area.

Made to your specifications, Blaw-Knox grating provides new highs in safety, easy up-keep and flexible application. For new ideas about grating—including space saving platforms and shelving, write for Bulletin 2486.

*Based on a study analyzing 803 compensable work injury claims closed in Illinois involving stairs and steps.

BLAW-KNOX

BLAW-KNOX COMPANY

Equipment Division
Dept. W, Pittsburgh 38, Pennsylvania

Exclusive "K&M" FLUID-TITE Coupling is permanently water-tight, with self-energizing rubber coupling rings. Unskilled labor can assemble it in any weather, without the use of heavy machinery. It allows deflection up to 5°.

From Los Angeles, Cal. to Bar Harbor, Me.

Modern communities all over the country are joining the trend to the modern pipe—"K&M" Asbestos-Cement Pressure Pipe with FLUID-TITE Coupling

- Permanent, water-tight connections
- Non-tuberculating
- Non-electrolytic
- Corrosion-resistant
- Long sections—fewer joints
- Pumping costs remain low
- Your low first cost is often your last cost

Write to us today for more information on how this modern "K&M" Asbestos-Cement Pressure Pipe can cut your costs and time. And free you from maintenance worries.

KEASBEY & MATTISON
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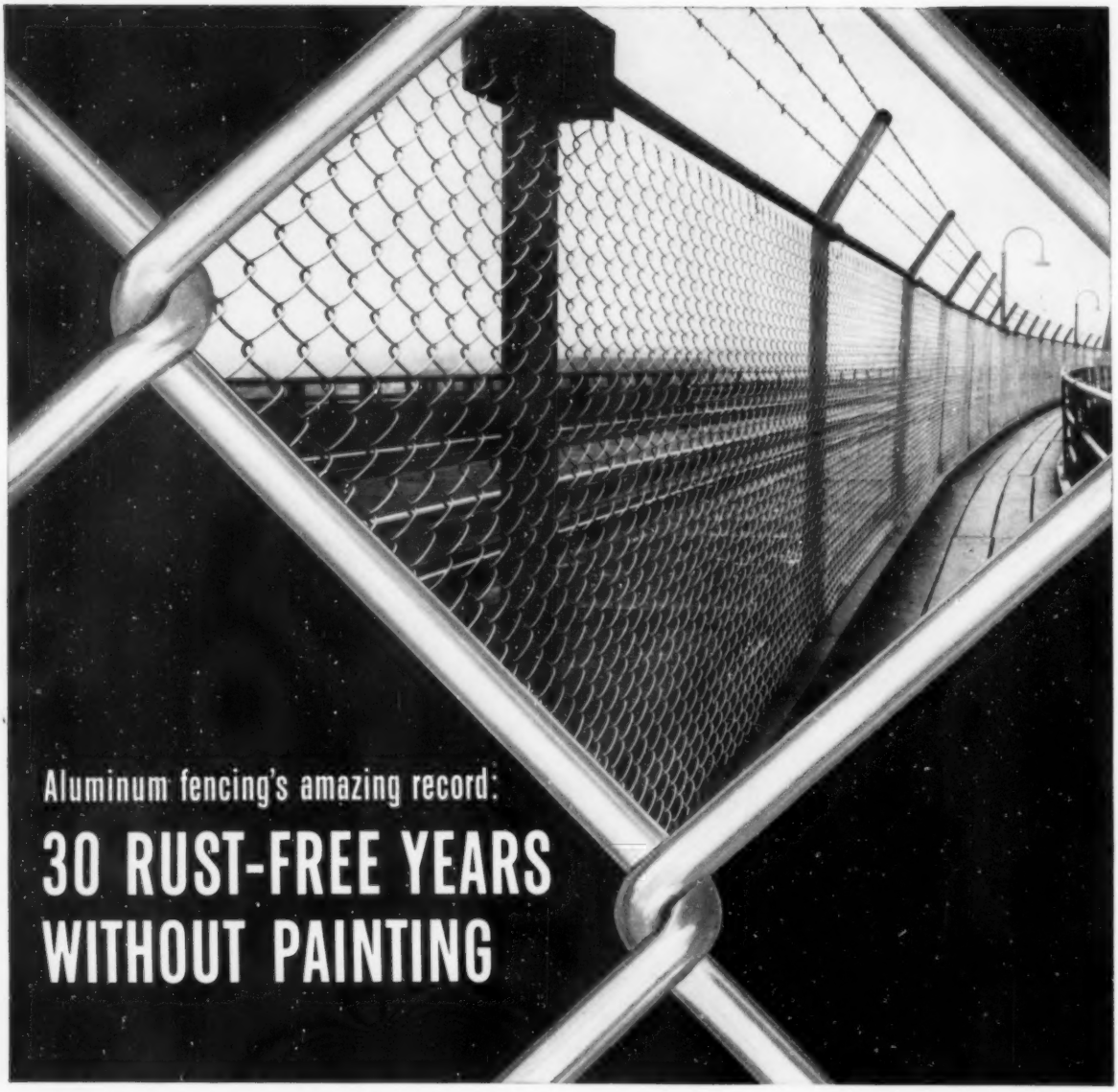
K·M BEST IN ASBESTOS



Chain Link Fencing of Alcoa Aluminum Now Available Throughout U.S. to Help You Cut Maintenance

Chain link fencing of Alcoa® Aluminum, for highways, divider strips and rights-of-way, is a bigger bargain than ever: the premium you pay for aluminum now amounts to *less* than the cost of one routine painting of ordinary metal fencing.

From this point on, you're money ahead with aluminum. This was proved recently by examination of an aluminum fence installation in Pittsburgh. Installed 30 years ago in a continuously corrosive atmosphere, it is still standing today and will probably live to be 100! The aluminum still has its original structural soundness and rust-free good looks . . . has never cost a penny in maintenance.

Long-life, trouble-free installations like this are typical, but check the many other exclusive advantages you get with fencing of Alcoa Aluminum:

- **High Strength**—Average tensile strength of Alcoa's new alloy is 57,500 lbs/sq in.
- **Easy Erection**—Light weight means it goes up faster with less labor.
- **Enduring Beauty**—Aluminum ages to a pleasing, soft gray; never rusts or peels.
- **Readily Available**—Reliable manufacturers and erectors in all 48 states can supply Alcoa Aluminum fencing and accessories. For the name of the supplier in your area, contact your nearest Alcoa sales office.

Send for Complete Specifications!

Alcoa's A.I.A. File 14-K contains complete specifications and technical data. For your copy, write Aluminum Company of America, 2147-F Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM

Your Guide to the Best in Aluminum Value

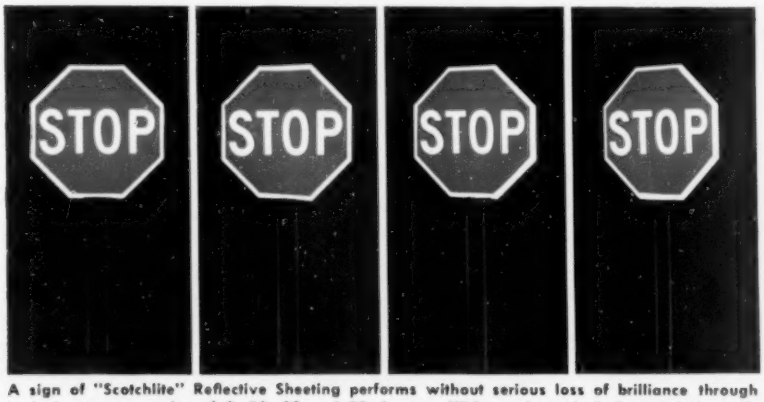
"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

What characteristics should an effective traffic sign possess?

Broadly speaking, the answer to this question lies in investigation of 4 vital factors. As you may guess, the first of these is performance, far and away the most obvious sign feature to motorists. And, after this come the equally important economic considerations of sign fabrication cost, installation and maintenance ease, and durability, or useful length of life. Let's look at each more closely.

Performance

A motorist on the road after dark needs the help of traffic signs even *more* than a daylight driver. Accident statistics bear this out. With growing traffic volume—20,000,000 vehicles on the road after dark—the need for modern 24-hours-a-day signing cannot be denied. Whether the sign is a 24″ x 24″ curve warning or an 8′ x 10′ guide panel, *reflectivity* is a characteristic an effective sign must possess.



A sign of "Scotchlite" Reflective Sheeting performs without serious loss of brilliance through typical entrance angles of 0, 10, 20 and 30 degrees. Wide angle optical characteristics help compensate for road curvatures, installation inaccuracies and accidental or deliberate damage.

Brilliance of "Scotchlite" Reflective Sheeting doesn't "black out," even in rainy weather. All-weather visibility of shape, color and legend means full-time traffic sign effectiveness.

Moreover, since the need for communication is greater after dark, the need to show all three elements of a traffic sign—shape, color and legend—is also greater. A sign that only shows one of these elements after the sun goes down is only doing 1/3 of its job. A modern sign should show all 3 to work for full-time safety at 100% effectiveness.

Effective communication in all weather is another desirable modern traffic sign performance characteristic. Federal Government specifications (military specification R 13689A) call for sign material that maintains *at least* 75% of dry reflection when subject to rainfall testing. The higher the percentage, the better the sign . . . for again, motorists need the help of traffic signs most when driving conditions are the worst.

The final performance factor is angularity. Typical tests of sign materials at viewing angles of 0°, 10°, 20° and 30° quickly show that a truly effective sign material will retain high reflective quality through any angle of approach. It allows you to put each sign where it ought to be. Wide angularity gives you a measure of compensation for installation inaccuracies and for road curvatures. Also, if a sign is accidentally or deliberately twisted or bent, it will still communicate because wide angle reflectivity keeps the sign message from disappearing.

Durability

This is the first of the economic considerations. You naturally want signs that withstand weathering well enough to fit into your normal sign maintenance cycle. And you want reflectivity to remain high throughout the sign life so that effective communication with the motorist is not interrupted by decreased brightness.

Economy

For economy in effective signing, you want the lowest overall dollar cost consistent with desired performance and durability characteristics. The material that gives you this figure—(formed by dividing length of useful life into the cost of fabrication, installation and maintenance)—will minimize the true cost of communicating with the motorist.

Fabrication

Sign fabrication should be fast, clean and foolproof to insure uniform signing at lowest cost. Highest optical performance depends on a quality controlled sign material not subject to variations in technique or conditions such as humidity and temperature.

The material you choose will also provide more flexibility if it lends itself to both machine and hand application to any kind of backing. For further simplification, it should give you quick, easy refurbishing of old signs, flat or embossed, as well.

These four primary factors and their parts, according to leading engineers, make up the characteristics an effective traffic sign should possess. How do you get all of them at once? We believe there is only one sign material which provides them all: "Scotchlite" Reflective Sheeting. This is the precision all-weather sign material that can give the performance motorists need, with the durability and ease of fabrication and maintenance that you demand.

Sign fabrication with "Scotchlite" Reflective Sheeting means professional results. Signs can be made in minutes by hand or machine.

★ ★ ★

See your 3M Representative soon and get more information on the truly modern effectiveness of durable traffic signs of "Scotchlite" Reflective Sheeting. Or write for details to 3M Company, Dept. QV-68, St. Paul 6, Minnesota.

REG. U. S. PAT. OFF.

SCOTCHLITE

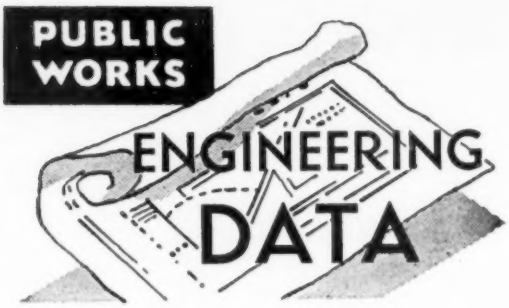
BRAND

REFLECTIVE SHEETING

PRODUCT OF 3M COMPANY RESEARCH

The term "Scotchlite" is a registered trademark of Minnesota Mining & Mfg. Co., St. Paul 6, Minn. General Export: 99 Park Ave., New York 16, N. Y. In Canada: P. O. Box 757, London, Ontario.

MINNESOTA MINING AND MANUFACTURING COMPANY—Where RESEARCH is the key to tomorrow



Cost of Maintaining and Operating Public Buildings

For the fiscal year 1956-57, it cost the City of New York $1.035 cents per square foot for maintaining and operating public buildings. Floor area was 7,316,-400 sq. ft. These data are from the annual report of the Department of Public Works, F. H. Zurmuhlen, Commissioner of Public Works.

Costs per square foot included: Supervision 5.2 cents; watchman service 2.5 cents; cleaning 43.8 cents; heating and ventilating 23.3 cents; elevator operation 11.5 cents; elevator maintenance 3.9 cents; electrical maintenance 1.9 cents; structural maintenance and alterations 4.8 cents; painting 2.7 cents; plumbing 1.4 cents; general services 1.9 cents; and equipment and furnishings 0.6 cent. Telephone service for the year was $513,066.

Fees for Mobile Home Parking

A survey was conducted in the fall of 1957 by the League of Wisconsin Municipalities to determine fees charged by member cities for parking house trailers. The survey showed that 50 percent of the 140 Wisconsin cities and villages levying a parking permit fee on house trailers, or mobile homes as they are called by statute, now charge $5 per month. Over ¾ of the reporting municipalities charge $3, $4 or $5 per month.

The minimum parking fee in the 140 municipalities is $1 and the maximum $10. The average fee in villages is $4.63. The average fee in cities of less than 10,000 is $4.75 and the average fee in cities of over 10,000 is $4.76.

Several municipalities reported fees which vary according to the length of the trailer, apparently in the attempt to relate the amount of the fee to the value of the trailer. The League's legal counsel has held that such license fees are of doubtful validity. Section 66.058 specifically provides that the amount of the fee shall be based on the cost of governmental and school services provided. The Wisconsin supreme court in Barnes v. West Allis (1956), 275 Wis. 31 held that the parking permit is not a property tax but is an excise tax. As an excise tax the valuation of the trailer is immaterial in determining the license fee.

The fees charged by various municipalities for a mobile home camp or park license vary widely. In general, however, the annual fees conform to the provisions of s. 66.058 (3) of the statutes which states that the annual license shall be not less than $25 and not more than $100 for each 50 spaces or fraction thereof. A number of communities have a minimum license of $25 or a fee of $2 per space which is the respective minimum and maximum established by

statute. Section 66.058 (1) (i) defines a mobile home park as "a plot or plots of ground upon which 2 or more units, occupied for dwelling or sleeping purposes are located, regardless of whether or not a charge is made for such accommodation."

As a result, the minimum fee is $25 for an annual park license even if only 2 trailers are parked.

Cost of Laying Water Pipe in Toledo

The excellent annual report for 1957 of the Toledo, O., Division of Water gives information on the cost of water main construction. Seven lines of 6-inch were laid, totalling 2,844 ft. The average cost per foot was $6.45 for lines 500 to 1000 ft. long and $7.40 for lines less than 500 ft. long. Based on an overall average cost of $6.80 per foot, materials cost 46.7 percent; pavement restoration and labor was 27.0 percent; hauling and equipment was 12.3 percent; and supervision and overhead was 7.2 percent. Engineering represented the remaining 6.8 percent of the cost.

Similar cost breakdowns were made for 12-inch pipe, of which 7,358 ft. were laid. Average cost was $22.74 per ft., being $27.95 for lines 500 to 1000 ft. long and $22.17 for lines over 1,000 ft. However, two lines of 12-in., 2,349 and 1,795 ft. long, cost $14.73 and $11.75 per foot. Average cost breakdown showed materials to cost 38.2 percent; pavement restoration and labor 34.0 percent; hauling and equipment 17.1 percent; supervision and overhead 7.05 percent; and engineering 3.65 percent.

Sol Wittenberg is Commissioner and George Van Dorp is Chief Engineer.

County To Erect Street And Road Signs

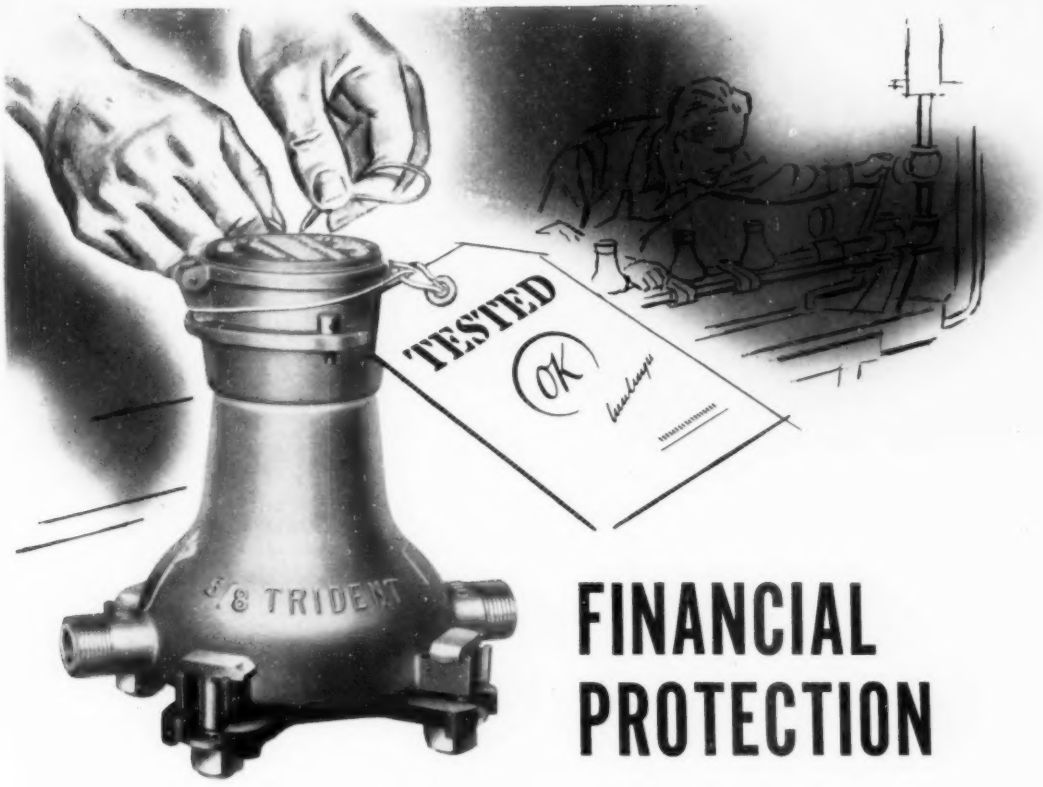
The St. Louis County Council, Clayton, Mo., has approved the program of John J. Leslie, County Highway Engineer, to erect street and road name and other informational signs on all streets and roads in the unincorporated areas of the County and has authorized him to proceed with the program during 1958. The budgeted cost of the program for 1958 was placed at $30,000. In his report to the Council, outlining details of the program, Mr. Leslie recommended reflective road identification sign faces on aluminum base plates mounted on aluminum alloy tubing, set in Portland cement concrete bases.

It is estimated there are approximately 360 major road intersections in the rural areas of St. Louis County which require road identification markers, creating a need for approximately 1,440 sign faces. In addition, information signs of the fingerboard type are needed at most of these intersections.

The color scheme of the proposed signs comprises a green background with white lettering, similar to that used on many toll roads.

Savings in the Michigan State Highway Department

The Michigan State Highway Department will save approximately $1,304,000 annually in administrative economies through a 16-point program of administrative reform. Specific annual savings were outlined as follows: 1) $1,000,000 on highway survey work through gradual elimination of outside private survey consultants and utilization of construction and other Department personnel; 2) $100,000 by reduction of overtime for Department personnel through improved controls during the construction season and elimination of overtime except in extreme emergency during the winter season; 3) $15,000



FINANCIAL PROTECTION

for your most vital service

Water . . . your community's most important single service . . . must be protected by sound financing. The only *sure* protection is the sustained accuracy of your water meters.

If a meter becomes inaccurate, it starts to give away revenue. In home after home, leaks and carelessness go scot-free. The warning voice of the meter is gradually stilled, and wanton waste soon uses up your available water supply.

Worse yet, lack of proper income makes it impossible to build new capacity without tremendous losses. Water shortages soon become critical. Your city's development program soon dies . . . of thirst.

How guard against this? Set up a good meter testing and repair program. Pick meters that stay accurate longer. Talk to your meter superintendent . . . the man whose efforts guard your water supply. Ask which brand of meter consistently gives highest sustained revenue . . . with lowest repair and depreciation. We sincerely believe your answer will be "Trident."

NEPTUNE METER COMPANY 19 West 50th Street • New York 20, N. Y.

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Branch Offices in Principal American and Canadian Cities.

neptune

201

TRIDENT WATER METERS

through elimination of unnecessary language in advertising highway construction proposals; 4) $50,000 through early purchase of bulk quantities of salt and calcium chloride for winter maintenance and by moving quantities by boat rather than by truck; $23,000 through recovery of office space formerly used for storage of inactive records and release of some 100 file cabinets through microfilming; 6) almost $100,000 per year through development of better coordination between design squads and electronic computer operations with utilization stepped up six times the former level; 7) $2,000 in postage through delivery of plans and proposals by parcel post special handling instead of special delivery; 8) $2,400 in telegraph charges through utilization of a Teleprinter and sending messages by the least expensive classification; and $11,300 through use of a photographic process in preparation of construction proposals eliminating considerable typing.

Operating a County Water System

The second year of operation of the Pierce-Union-Batavia subdistrict of the Clermont County, O., water system has been successful. This system served 2585 customers at the end of 1957, an increase of 115 during the year. The water supply comes from three wells, two of which are operated at a time regularly on a weekly rotational basis. The quality of the water is good, though the water is hard. Iron and manganese in the raw water are removed and the finished water is treated with Calgon. Softening is contemplated for the future.

Water consumption increased during 1957 to 326,000 gpd from an average of 282,000 gpd in 1956. This amounted to 131 gallons per connection or about 40 gallons per capita per day. Metered water sales amounted to $222,998 or $88.07 per customer, with other income totalling $5,867.13. Operating cost of the system was $63,332.67 or $25.02 per connection. Revenues permitted good operation and adequate maintenance, payment of debt service requirements and allocation of $74,696.82 to the bond reserve fund. During 1957, $98,800 was paid into the bond interest and redemption fund.

Carl H. Rush is county sanitary engineer; Harlan H. Mace is manager; and William Iles, Jr., is superintendent. Office of the Pierce-Union-Batavia subdistrict of the system is at Amelia, O.

City Street Maintenance Needs Inventory

By regularly covering all streets in the city, San Diego, Calif., keeps an up-to-date record of its street maintenance needs. To do this quickly and economically, it uses portable, battery-powered dictating machines and electronic punched card equipment. Street inspectors of the public works department regularly cover each area of the city to note broken curbs, holes in the pavement, and other street and sidewalk deficiencies. Each deficiency is indicated by its precise location (district, area, and quarter block), and by cost account and work units required. From the dictated notes, cards are punched and tabulated to show each location requiring maintenance work and the amount and kind of work needed. Listings also can be run in route sequence to minimize the travel time of maintenance crews. The maintenance inventory supplements a complete physical inventory of all streets which forms the basis for the street resurfacing program. The physical inventory also is recorded on punched cards, and both sets of data for budgeting and planning.

This guy is a fast operator

. . . look at his backhoe!

It's the all-new *SHAWNEE 88*. He can knock off for a smoke because he's long on time. Earth has never been trenched faster!

Buy-wise and bid-wise, the *SHAWNEE 88* gives you a profit edge. It's the one backhoe built for a fast operator. Plenty of digging power. No sweat, either. The *SHAWNEE 88* is smooth and fast — the fastest backhoe of them all. Ever see one styled to beat it?

It sits comfortably, handles perfectly, and gives you no trouble. Mounts on any tractor you choose. Try the *SHAWNEE 88*. Try it and you'll buy it. *It even costs less.*

The SHAWNEE 88 digs 12', dumps 9'9", reaches 16'6" and has 180° uninterrupted swing. "Hidden cylinder" activates quick-detach, all-purpose bucket.

Presented through your tractor dealer

By

SHAWNEE

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TOPEKA, KANSAS

WRITE TODAY FOR FREE DETAILS

IMAGINE THAT! *The BALANCED Impeller may be trimmed to suit other heads and capacities -- yet REQUIRES NO SEPARATE COUNTERBALANCE.*

PATENT PENDING

AURORA
NON-CLOG
HORIZONTAL & VERTICAL
MONO-VANE
SINGLE PASSAGE IMPELLER
PUMPS

WRITE
for
BULLETIN 121 MV

Type KGG Aurora Horizontal Mono-Vane Non-Clog Pump

The exclusive new Mono-Vane impeller represents a major advance in the technique of non-clog pumping. This unique impeller can be trimmed to various diameters — REQUIRES NO SEPARATE COUNTERBALANCE because it is in dynamic and hydraulic balance — and affords a wide range of operation by merely trimming the impeller for each head and capacity requirement.

UNSURPASSED FOR HANDLING LONG STRINGY SOLIDS

•

IDEAL FOR ELEVATING SEWAGE — PUMPING SLUDGE — HANDLING HEAVY SETTLEABLE SOLIDS, EFFLUENT AND OTHER WASTES

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TROUBLE-FREE PERFORMANCE — CONVENIENCE and LASTING ECONOMY

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DISCHARGE MAY BE TURNED TO ANY POSITION — ACCESSIBLE for CLEANING

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SMOOTH, QUIET OPERATION

Type KU Aurora Vertical Mono-Vane Non-Clog Pump

Your Inquiries Will Command Our Prompt Attention

AURORA Always PUMPS

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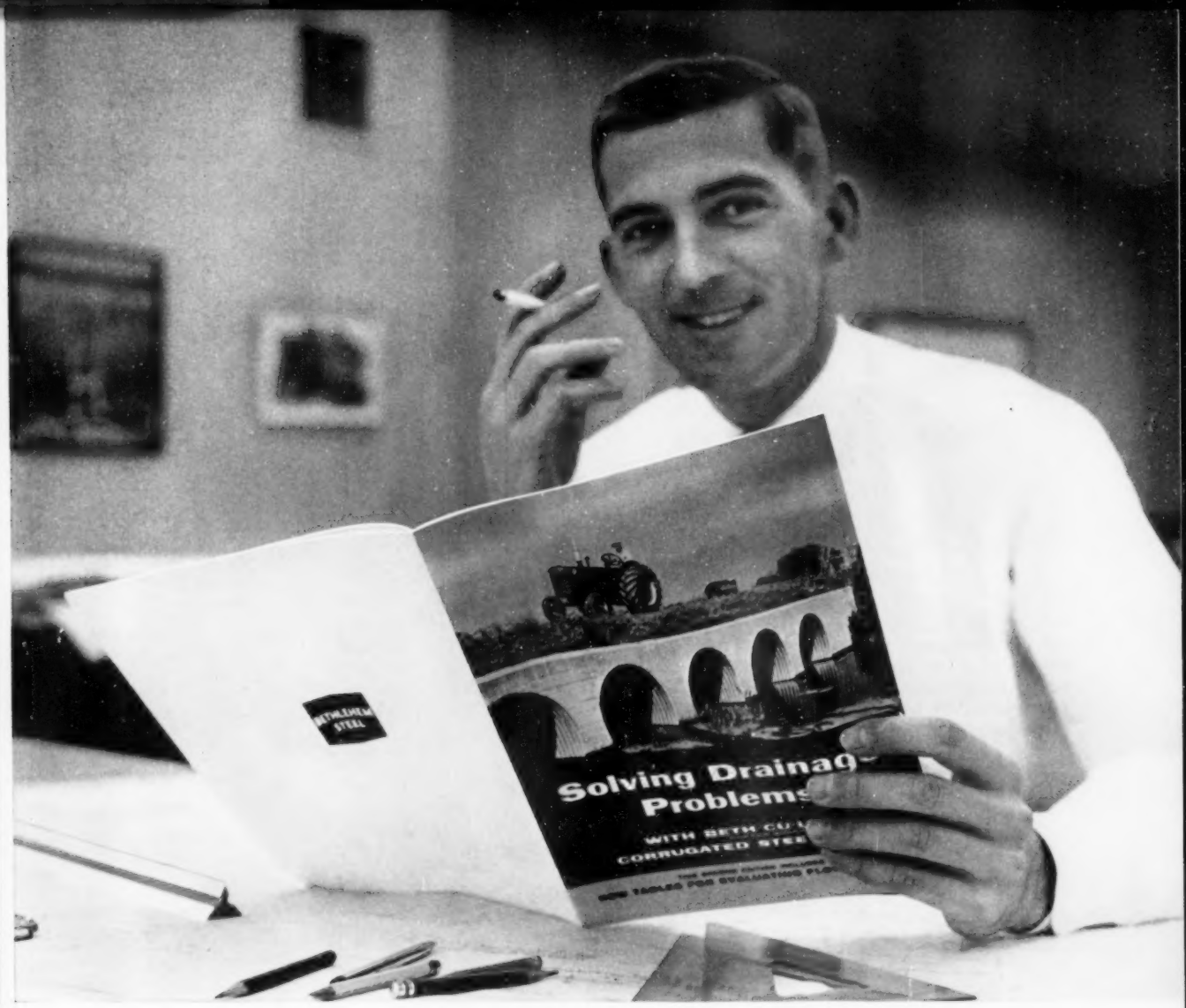

SEND NOW

For your copy of "Solving Drainage Problems"

If your work in any way involves the problems of drainage, here is a practical, helpful reference for your bookshelf. It's Bethlehem's Booklet 425, "Solving Drainage Problems," with 76 pages of down-to-earth engineering material which any contractor, engineer or township official can use in designing, specifying, and installing.

SPECIAL TABULAR SUPPLEMENT

The booklet is crammed with graphs, charts and nomographs—specifically compiled to help you design drainage structures, calculate run-off, and solve other engineering problems. In addition, it contains a brand-new supplement of eight pipe-design tables, along with a pamphlet explaining in detail how to use these valuable new tables. Much of the material has never been made generally available before.

FILL OUT THE COUPON NOW!

The first printing of this booklet was exhausted within a month! This new edition, revised and improved over the original, is now ready. Fill out and send in the coupon today!

BETHLEHEM STEEL COMPANY
ROOM 1041A
BETHLEHEM, PA.

Please send me a copy of Booklet No. 425 "Solving Drainage Problems"

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*CITY AND STATE*_____

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

3 top contractors tell how **Transite Sewer Pipe** helped keep installation costs low on the Allegheny County Sanitary Authority sewage project (Allegheny County, Pa.)

"Transite saved us considerable labor especially when we were working in 18- to 28-foot trenches . . ."

says W. R. Davies, W. R. Davies Company
Pittsburgh, Pennsylvania

"For the Allegheny County Sanitary Authority we used Transite Pipe for Sanitary Sewers because it is faster to install, lighter, and more readily handled than the other materials specified as alternates. Transite saved us considerable labor especially when we were working in 18- to 28-foot trenches.

"Another part of our 'Authority' contract included the installation of 5,300 feet of Domestic Water and Fire lines at the 150 MGD capacity Pittsburgh Sewage Treatment Plant. We used Transite Pressure Pipe for this entire job. Our costs were low because it is faster to install."

W. R. Davies Co. installation.

"In a remarkably short time, our men installed two miles of Transite . . . even though they worked below the adjacent river level . . . and between railroad tracks and one of the most congested highways in the county . . ."

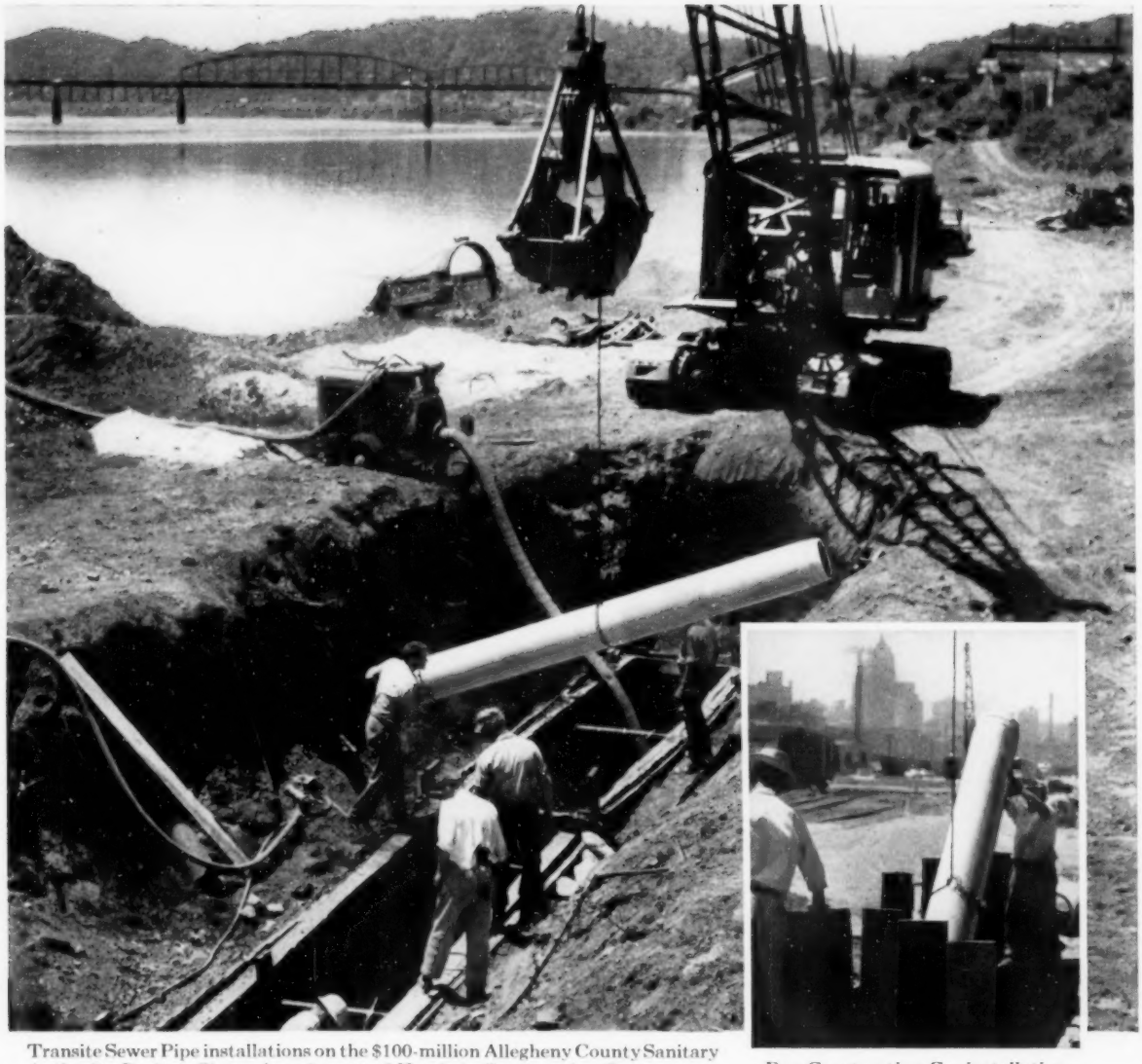
says P. A. Benintend, Ben Construction Company
Pittsburgh, Pennsylvania

"For the Allegheny County Sanitary Authority Contract, Transite's ease of installation . . . sure coupling . . . and 13-foot lengths saved money for us in over-all installation. In a remarkably short time, our men installed two miles of Transite Sewer Pipe and force mains, even though they worked below the adjacent river level to install the force main—and between railroad tracks and one of the most congested highways in the county to install the sewer. Speed of installation plus prompt delivery enabled us to finish the job well before the required completion date."

"We installed Transite Sewer Pipe in some of the toughest locations on this job."

says D. C. Rothey, Project Manager
Harrison Construction Company
Pittsburgh, Pennsylvania

"In our stretch down along the Allegheny River we were constantly 5 to 14 feet below normal pool stage level. Final inspection revealed no infiltration."



Transite Sewer Pipe installations on the $100-million Allegheny County Sanitary Authority Project. Shown here is part of Harrison Construction Co. contract.

Ben Construction Co. installation.

How TRANSITE PIPE answers your two most important problems in sewer installation and operation!

In installation, your big problem is time. For the longer it takes to complete a "tight" installation the more it costs . . . the more annoying the problem of torn-up, detoured streets. And this is where Transite® pays its way in time-saving alone. Its lightweight, long lengths and quickly, *surely* assembled Ring-Tite® Coupling speed every step of installation.

In operation, infiltration and root-clogging can be even more costly. But they're problems that Transite's Ring-Tite® Coupling was designed to solve. Rubber sealing rings, tightly compressed between sleeve and pipe, give you a tight, long-lasting joint that locks out roots . . . seals out unwanted ground water.

Let us send you booklet TR-165A. Address Johns-Manville, PW Box 14, New York 16, N.Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Look at
Highland Park's No. 977...

BUSY AT BOTH ENDS!

The sanitary landfill area in the Borough of Highland Park, N. J., covers about 20 acres and a lot of it is shale. It used to take air hammers to loosen the shale for trenching. This meant time and extra money. Today a Caterpillar No. 977 Traxcavator* simply pulls a CAT* No. 6 Ripper through the shale, making it possible for the Traxcavator to build the trench quickly and inexpensively. Then the No. 977 dumps and compacts the garbage in the trench. On this job the No. 977 is replacing a tractor and at last reports was handling what was formerly eight hours' work in one.

The No. 977 is one of three Cat-built Traxcavators with bucket capacities from 1 to 2¼ cu. yd. You saw how versatile the Traxcavator is with a ripper attached, but only an actual demonstration on your own project can show you the amazing versatility of this machine. Ask your Caterpillar Dealer especially about the brand-new side dump bucket which only the Traxcavator offers. Note this, too: all Traxcavator models are available with a heavy-duty undercarriage for those tougher jobs that put extra strain on your equipment. But get the whole story firsthand right now. A Traxcavator can save you tax dollars—pick up your phone, call your Caterpillar Dealer and find out how.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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VOLUME 89, NO. 6 PUBLIC WORKS MAGAZINE JUNE 1958

Courtesy Inertol Co

● SWIMMING and wading pools at Verdun, Canada. Heavy pool use requires efficient chlorination.

Disinfection of PUBLIC SWIMMING POOLS

EDMUND J. LAUBUSCH, S. M.,
Sanitary Engineer,
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DISINFECTION of swimming pool waters has a two-fold objective: to destroy pathogens and other organisms of sanitary significance that may be present in water entering the pool and to destroy such organisms as may be introduced, casually or deliberately, by persons using the pool. The situation obviously is not directly comparable with that for drinking water since most persons swallow little or no water while bathing and because there is usually a fairly rapid change of water in contact with the bather.

There is little or no reliable data to indict bathing places in the spread of the usual respiratory, dermatological and gastrointestinal disorders associated with bathing in polluted waters. In the absence of such conclusive epidemiological evidence, leading authorities on the subject contend that bathing place sanitation is not a major public health problem. Notwithstanding, they also recognize that bathing in polluted water, especially swimming pools, does present a potential hazard and that adequate safeguards should attend all installations to insure a clean and healthful bathing environment. Satisfactory conditions exist only when there is provided and maintained at all times an active disinfectant in sufficient concentrations to effect prompt and continuous pollution control.

Statutory Control

Except for those facilities owned or operated by the government and intended for the exclusive benefit of government personnel, no Federal agency is empowered to develop, promulgate or enforce any regulations relative to the design, construction or operation of swimming pools or other bathing places.

Forty states currently have some kind of statutory authority in this area. The majority of these base their authority on a very broad statute; only about half of all states have enabling legislation authorizing the establishment of minimum standards of design, construction and operation of public swimming pools. All states, by definition or implication, specifically exclude regulation of swimming pools at private residences.

No data are currently available indicative of the extent of county or municipal regulations governing public bathing facilities. It is believed that those that might exist would not differ significantly in scope from those of the various states.

The Joint Committee on Bathing Places, representing the Conference of State Sanitary Engineers and the Engineering and Sanitation Section of the American Public Health Association, is the principal body concerned with this subject. Ten reports (and several revisions) have been prepared by this committee since its formation in 1925. These reports,

Courtesy American Playground Device

● **SWIMMING pool at Hotel Fontainebleau, Miami Beach, Florida, is a good example of a modern, well-equipped facility. Adequate water treatment is always necessary.**

purported to represent the group thinking of individuals most deeply concerned with and actively engaged in swimming pool sanitation, serve generally as the basis of regulatory codes for at least half of the states having pertinent statutory authority.

The States of Alabama, Idaho, Massachusetts, New Hampshire, New Jersey, North Carolina, Tennessee and Virginia function generally in an advisory capacity only. Virginia, however, has a code applicable to hotel and motel pools.

Pool Classification

Swimming pools may be classified generally as fill-and-draw, flowing through, and recirculation types depending on the scheme of operation.

Fill-and-draw pools, though still fairly common, definitely are outmoded. Operation involves filling of the pool with fresh water and discharging the entire pool contents to waste after a period of use during which pollution can accumulate to an obnoxious and insanitary degree. Satisfactory disinfection of such pools frequently is impossible and their use is not recommended.

Flowing-through pools are of a more recent origin. Operation involves continuous discharge to waste of a portion of the pool contents and continuous addition of fresh water in such volume to remove pollution where disinfection is not employed. Sanitary operation of such pools is very difficult and expensive, especially where the bathing load is high or erratic. Consequently, these pools are being received with considerably less favor and the trend is away from their use. At least six States discourage or prohibit their use; most States require that chlorine disinfection be employed, usually on a continuous basis, and this also is recommended by the Joint Committee.

Recirculation pools are the most satisfactory. Operation involves rapid and continuous recirculation of treated water and the maintenance of an effective disinfecting capacity even under extreme conditions of pool use. For this reason it is the pool type most commonly endorsed by sanitary authorities and others concerned.

Chlorine

Various forms of chlorine are employed for disinfection of swimming pools including particularly: liquid chlorine (dispensed as a gas and in water solution), calcium hypochlorite (in solution, granular or tablet form), and sodium hypochlorite ("laundry bleach" solution). By far, chlorine is the most widely recommended disinfectant.

Chlorine, as a solution of gas in water or as a hypochlorite solution, is the only disinfectant recommended by the Joint Committee although certain other disinfectants are recognized as being efficacious in counteracting contaminants that may be present in the water or introduced by bathers. In the past few decades hypochlorite forms of chlorine have been received with increasing favor, especially since the advent of the so-called "high-test (calcium) hypochlorites" (containing 70% available chlorine) and, more recently, their availability in tablet form. Moreover, the relative ease of equipment maintenance, even during long periods of disuse, is an especially attractive feature. There is every indication that use of chlorine will become more widespread, especially the tablet hypochlorites that are so convenient for disinfection of smaller pools.

While there is no difference in the disinfecting power of a fixed quantity of available chlorine in various forms, there is sometimes an apparent difference due perhaps to local pH effects and differences in reactivity of chlorine-consuming materials. The relative merits of chlorine gas vs. hypochlorites employed under identical conditions, principally involve consideration of economy, ease of handling and safety aspects associated with their use.

Only five states suggest any preference relative to the use of gaseous and hypochlorite chlorine. Two of these, Alabama and Idaho, function only as advisory bodies. Chlorine gas is preferred by Alabama authorities when the pool recirculation rate exceeds 150 gpm. In Florida the use of chlorine gas is recommended for all public pools, and its use is required at all installations exceeding 70,000 gal. capacity. Mississippi authorities believe that hypochlorite disinfection is practical only for small pools; Idaho authorities also tend to support gaseous chlorine treatment. Connecticut is the only state publicly acknowledg-

ing that for safety reasons it is usually preferable to use hypochlorites, especially at indoor pool installations.

The combination of ammonia with chlorine is sometimes employed and is especially indicated in certain very large or outdoor pools and other bathing areas because of the greater persistence of chloramine residuals. Chloramines, however, are decidedly slower acting disinfectants than is the HOCll released when chlorine (in its various forms) is added to water. For this reason the Joint Committee is of the opinion that the use of chlorine is generally more satisfactory than that of chlorine with ammonia. The current status of this practice is that in most instances chlorine alone is the disinfectant of choice.

Other Disinfectants

Several pools, particularly in Illinois, employ bromine as a swimming pool disinfectant. Like chlorine, bromine is considered a satisfactory disinfectant by the Joint Committee because it not only accomplished disinfection of the contents of the pool, but also because there can readily be maintained at all times a controllable residual to counteract contamination introduced by the bathers. Not unlike chlorine, however, special safety precautions must be observed in handling bromine.

Only 4 states specifically acknowledge the use of bromine: Illinois, Iowa, New Jersey and North Carolina. In South Dakota its use is permitted only by special approval. Other states, to the extent that they follow the recommendations of the Joint Committee, perhaps maintain a similar position.

Ozone is a satisfactory disinfectant, but data on its use for swimming pool disinfection are sparse and inconclusive. Furthermore, there is no evidence that ozone has a residual sterilizing effect—an especially important feature as heretofore noted. Its use as a disinfectant is acknowledged by State health authorities in Indiana and North Carolina, the latter of which functions only as an advisory group.

While ionized silver is used extensively abroad, only a few domestic applications have been reported. Because of limitations and inconsistencies noted in reports currently available, ionized silver is not included as a recommended disinfectant by the Joint Committee.

Satisfactory bacterial destruction can be accomplished by exposing thin films of clear water to ultra violet rays, but there appears to be no evidence available that a residual effect is achieved. Because of this, and lacking means of detecting or controlling any possible residual, ultra violet treatment alone is not now considered satisfactory for pools, particularly where bathing loads and fluctuations thereof are appreciable. As for ozone, Indiana and North Carolina acknowledge its use as a suitable disinfectant for public swimming pools.

Theory of Chlorination

When a solution of chlorine gas or hypochlorite is added to water, it reacts to form hydrochloric and hypochlorous acid:

$$Cl_2 + H_2O \rightarrow HCl + HOCl \quad \text{(Eq. 1)}$$

The hypochlorous acid ionizes or dissociates into hydrogen and hypochlorite ions;

$$HOCl \rightarrow H^+ + OCl^- \quad \text{(Eq. 2)}$$

Both reactions are dependent upon the pH value of the water. The first (Eq. 1) predominates at low pH levels, and the second (Eq. 2) predominates at higher pH levels. At low pH levels free available chlorine residuals consist predominately of hypochlorous acid, HOCl. Above pH 7.5 hypochlorite ions, OCl^-, predominate, while above pH 9.5, free available chlorine residuals consist almost entirely of hypochlorite ions.

When chlorine combines with other substances in the water, chlor-derivative or substitution products are formed. If natural or added ammonia is present a combined available chlorine residual, containing little or no free available chlorine, is obtained. At pH below 4.4, nitrogen trichloride will prevail. Between 4.4 and about 8.5 monochloramines and dichloramines will exist, while above 8.5 monochloramines will predominate.

The mechanism of bacterial inactivation or destruction by chlorine is not clear. It appears that whatever the mechanism, it is independent of the form in which chlorine is applied; that is, hypochlorites react with water in the same manner as chlorine gas to produce free or combined available chlorine forms. It has been demonstrated that the disinfecting capacity of hypochlorous acid (at relatively low pH) is much greater than that of hypochlorite ions that predominate at pH 7.5. Thus, while more can be accomplished theoretically at a pH of or slightly above 7.0, other considerations sometime suggest operating at higher pH levels up to about 8.0. Beyond this pH level, any advantages of operating at high alkalinities occur with sacrifice to the disinfection action of chlorine.

Courtesy Fischer & Porter

● **TABLET hypochlorinator is well adapted to swimming pool installations.**

Chlorination Practice

The type of available chlorine residual desired and the characteristics of the water being treated determine the process of chlorine disinfection to be employed. All chlorination practice, irrespective of the point of application, may be classified as either combined residual chlorination or free residual chlorination, depending on the nature of chlorine remaining i.e., of the chlorine residual.

The relatively low oxidation potential of combined available chlorine forms accounts for its slower bactericidal action as compared to free available chlorine. Data have been published to show that about 25 times as much combined available chlorine residual as free available chlorine residual is required to obtain equivalent bacterial reduction within the same exposure period; and with the same amount of residual an exposure period about 100 times as great is required to obtain equivalent bacterial kills. Data also are available demonstrating the persistency of combined chlorine residuals as compared to free chlorine residuals.

Chlorine-ammonia treatment has never enjoyed priority recommendations of the Joint Committee although that group does recognize that, under certain conditions, chlor-

Table 1—Chlorine Residual Requirements

Chlorine, mg/L		Types of Residual, by States	
Min.	Max.	Free Chlorine	Undefined Residual
Not specified		....	Ariz., Ga., Ill., Miss.,[1] Mass.,[2] N.H., N.C., N.D., Vt., Va., W. Va., Wyo.
0.1	0.5	Calif.	Del.
0.2	0.5	Tex.	Mont., Nev., S.C.
0.3	0.6	Mich.	Fla.
0.3	...	Col., Md., N.Y.	....
0.35	0.75	....	Ut.
0.4	0.6	Conn., Kan.,[2] N.J.[2] Tenn.	Ark., Ida., Ind., Ia., Ky., La., Me., O., Okla.,[2] Ore., R.I., S.D.
0.4	1.0	Wis.	Penna.[2]
0.4	...	Neb., N.M., Wash.[2]	....
0.5	...	....	Minn.
0.6	1.0	....	Ala.
1.0	...	Mo.[2]	....

[1]Six states refer to Joint Committee Recommendations.

[2]Have separate requirements for high-free chlorine residuals, related in some cases to pH.

Table 2—pH Level Requirements

pH Range Defined		States
Not specified		Ariz., Ill., Ia., Miss., N.H., Utah, Va.
7.0		Ark., Del., Fla., Ga., La., Mo.,[1] Mont., Nev., N.C., N.D., O., Pa., R.I., S.D., Vt., W. Va., Wis., Wyo.
7.0	7.4	Ore.
7.0	7.5	Me.
7.0	7.6	Kan., N.J.
7.0	7.8	Okla.[2]
7.0	8.0	Minn., N.M., N.Y.
7.0	8.2	Ky.[3]
7.2	7.6	Conn., Ida., Ind., Md., Mich., Tenn.
7.2	8.0	Calif., Col., Tex.
7.4	8.9	Wash.[4]
7.5	8.3	S.C.
8.0	8.5	Ala.
8.0	8.9	Mass.[4]
Other		Neb.[5]

[1]Seven states refer to Joint Committee recommendations; Ark. specifies no caustic alkalinity; R. I. recommends pH "near seven."

[2]7.2 to 7.8 preferred.

[3]7.6 to 8.2 preferred.

[4]Refers to high-free residual chlorination.

[5]pH to be such as to avoid eye irritation and assure efficacy of chlorine while a free residual of 0.4 mg/L is maintained.

amine disinfection may produce better over-all results than chlorine treatment alone. In general, however, the latter is the procedure of choice.

As previously noted, chlorine reacts with organic impurities in water to form combined available chlorine. If sufficient chlorine is applied, in the absence of added ammonia, the residual ultimately will contain some free available chlorine irrespective of the concentration of organic impurities initially present in the water. Only when the dose is sufficiently large so that free chlorine predominates will oxidation reactions prevail.

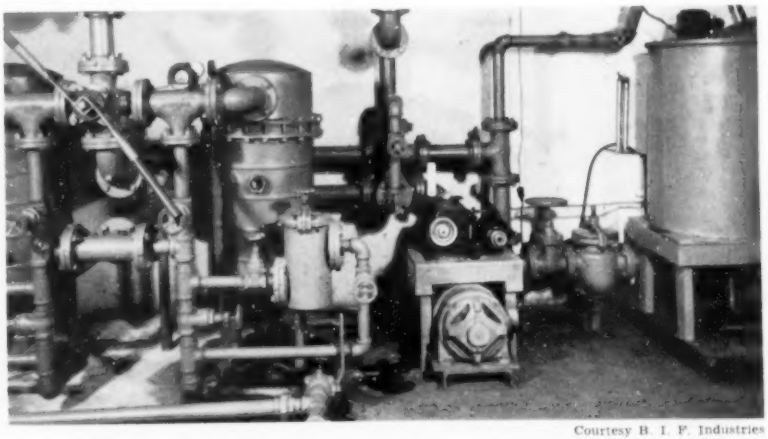
State-regulated or recommended chlorine residuals and corresponding pH levels (exclusive of high-free residual chlorination practice) are summarized in Tables 1 and 2. These summaries illustrate the wide variations in State policy relative to public swimming pool disinfection requirements. Exclusive of those States that generally follow the joint Committee recommendations but do not specifically define residual chlorine requirements in their codes, actually only two States conform to the letter of the latest Joint Committee recommendations in this regard while about 20 others conform to earlier recommendations. In regard to operating pH levels, the situation is roughly similar.

For some time the English have employed high-free residual chlorination (under the term breakpoint chlorination) in which concentrations of free available chlorine of 1.0 mg/L or greater are maintained with accompanying high alkalinities. More consistent satisfactory bacteriological conditions (especially in outdoor pools), clearer water, and reduced incidence of eye irritation are the advantages claimed. Interestingly, the 1957 issue of Joint Committee Report is the first in which this process is acknowledged. Only Kansas, Massachusetts, Missouri, New Jersey, Oklahoma, Pennsylvania, and Washington officially acknowledge its use; there is some evidence, however, that its application is substantially more widespread.

Effective results are contingent on attaining thorough and uniform distribution of the disinfectant throughout the pool. Basically two methods of chlorine disinfection are applicable to recirculation pools: prechlorination (ahead of the filters) and post-chlorination (after the filters). The latter is not as widely used and is more limited in its scope than prechlorination. Post-chlorination is sometimes desirable in pools containing an extremely large amount of oxidizable organic materials.

Pre-chlorination is specified by Illinois, Michigan, Mississippi and Missouri. Connecticut specifies that chlorine be applied either at the discharge side of the recirculation pump beyond the filters or between the pumps and the filters.

(*Continued on page* 176)



Courtesy B. I. F. Industries

● **FILTERS** *are* **usually required in a swimming pool installation, as well as chlorination. These pressure type filters remove hair, lint and other suspended matter.**

GOOD RECORDS HELP SEWAGE PLANT OPERATION

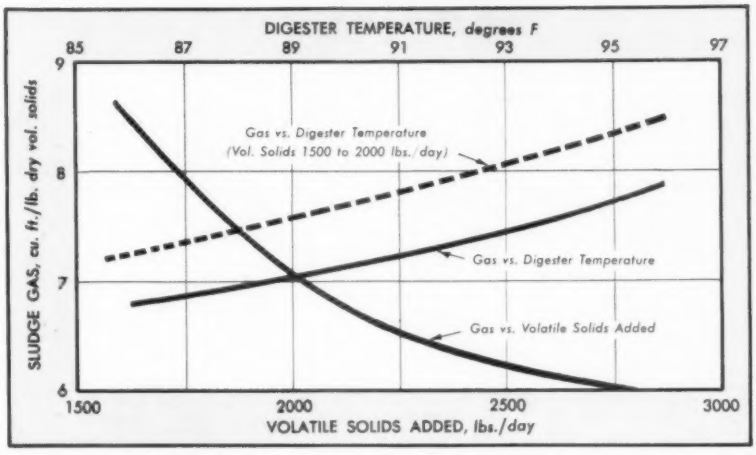
RUSSELL L. JOHNSON
Sanitary Engineer in Charge
State Dept. of Health, Escanaba, Mich.

WAYS IN WHICH good records of sludge digestion can be used to explain poor gas production were demonstrated at a training meeting for operators in Michigan's Upper Peninsula. The presentation included use of actual data from the 25-year old municipal sewage treatment plant at Escanaba. Here the average daily amount of gas collected in October (3.9 cu. ft. per pound of dry volatile solids added) was the least in over four years. The fact that this represented a problem was brought out by another comparison. The quantity of gas had dropped to 0.85 cu. ft. per capita, or toward the low end of the range (0.7 to 1.5) considered normal.

The search for an explanation utilized the excellent operation records kept by the plant superintendent. These records showed that the slump involved the total gas produced, as well as the amount per pound of dry volatile solids added to the digesters. The pH of the digesting sludge was satisfactory. A steady decline had occurred despite the maintenance of temperatures usually considered favorable (89° to 96°F). The operation reports also indicated an accompanying increase in the daily addition of volatile solids. This latter trend seemed to point out an inverse relation between the amount of solids added and the volume of gas produced.

So that they might have a more complete picture, the operators at the school were given tables showing the monthly averages of volatile solids added, gas production and temperatures for every year since 1947. These tables showed that no gas at all was produced during much of 1951 and 1952 and that gas production had stopped during a 6-month period when the average daily additions of dry volatile solids exceeded 3,000 pounds. While there were other factors involved, significant volumes of gas were not obtained until October, 1952, or after a 2-month period when the additions averaged less than 1,625 pounds.

The sets of monthly averages were employed by the class in analyzing the data. The method used was to list the gas production figures in groups according to the number of pounds of dry volatile solids added and the temperature maintained in the heated digester. At the Escanaba plant, both of the separate sludge digestion tanks were equipped with floating covers; however, only one tank is heated. Each group of production figures was then rearranged in the order of magnitude to permit statistical evaluation and the determination of the means. These values were used to draw the three curves on the chart herewith.



● **HOW digester temperatures and volatile solids affect sludge gas production.**

As shown by the curve, gas vs. volatile solids added, increasing the load on the digesters results in decreasing gas production. At Escanaba, this is partly due to a decrease in the already short period allowed for digestive processes to be accomplished. This period is short because all the raw sludge is pumped into the heated tank, and some of the contents must be transferred every few days to the other tank. Therefore, there also is a good possibility that the optimum ratio of raw to digested sludge is sometimes exceeded.

The capacity of the heated tank when completely filled has been calculated as about 22,600 cubic feet. Based on the 1950 population of 15,170, this amounts to only 1½ cu. ft. per capita. With a daily addition of 2,750 pounds of dry volatile solids—the average amount put into the tank during 1951—the capacity is only 8 cubic feet per pound of dry volatile solids, or less than one-third of the volume recommended for plants in Michigan. Either basis denotes a capacity quite low for a plant providing complete treatment, which is the case at Escanaba.

The provision of additional digester capacity at this plant has been recommended. Meanwhile, as was pointed out at the operator training meeting, the situation is one which calls for greater attention to other factors. At Escanaba some of these factors are subject to regulation. Raw sludge is pumped frequently (usually four times a day) so as to avoid shock loads. An attempt is also made to keep to a minimum the actual volume of wet sludge added. While desirable, it has not been possible to split the additions between the two tanks because only one is heated.

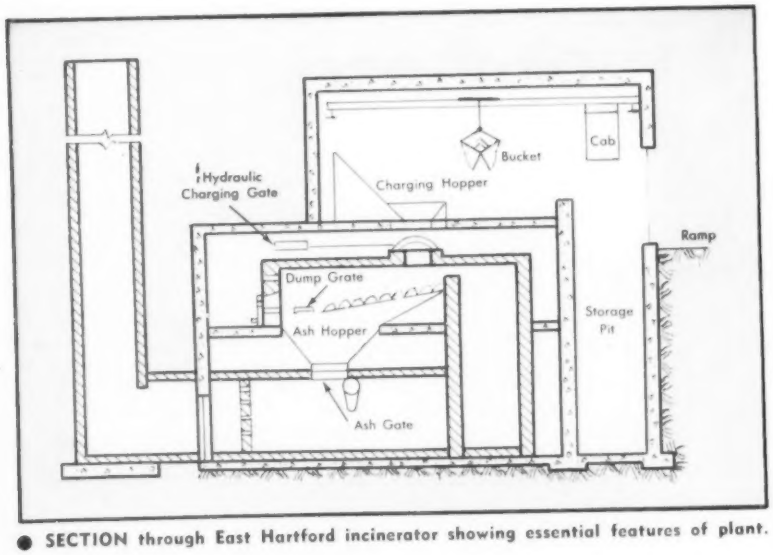
Attention was called to another desirable practice, especially when little gas is available for heating purposes. This is to maintain the most favorable digestion temperature, so as to halt the "vicious circle" before it goes too far. As shown by the two parallel curves of the chart, the lower the temperature the less gas is produced. The lower curve represents gas production at different temperatures during the entire five-year period. The dotted line represents production at different temperatures for those months when the rate of solids addition was fairly low (1,500 to 2,000 pounds dry volatile solids per day). The results suggest that a third curve, below the other two, would be obtained by plotting production against temperature for those months when the rate of solids addition was in the higher (2,000 to 3,000 pounds per day) range.

INCINERATOR NEAR RESIDENTIAL AREA *is Nuisance Free*

TO PROVIDE adequate refuse disposal for the industrial city of East Hartford, Conn., an efficient 200-ton incinerator has been constructed. This plant, built at a cost of $510,000, was necessitated by lack of land area for disposal by sanitary fill, the method which had been used previously. The two 100-ton per 24-hr. units, with pit and traveling crane, have been in operation for about 18 months. The daily load, ranging from 80 to 100 tons, has been handled by one shift with an operating force of a foreman-mechanic; a crane operator; a charging floor man; two stokers (one for each furnace); an ash handling truck driver; and a spare or relief man. Output has averaged 1.4 tons of refuse incinerated per man-hour per plant employee. There has been no problem from odors or stack discharges. Population of East Hartford is about 60,000. The $510,000 cost is exclusive of land, piling and collection equipment.

● **ATTRACTIVE and modern structure houses the East Hartford incinerator.**

The furnaces are rectangular, with hydraulic stokers and hydraulic dumping grates. A common expansion chamber and chimney serves both furnaces. There are three floor levels—charging, stoking and ash handling. The incoming refuse is weighed and dumped into a storage pit covered by three motorized overhead doors controlled from the scale room which is adjacent. A storage capacity of 800 cu. yds. or 160 tons is provided in the bin. The Howe truck scale has a concrete deck 34 ft. long by 10 ft. wide, and has a capacity up to 20 tons. The cabinet indicating dial and printer is located inside the scale room and office. The printing mechanism provides a record on cards of the date and time of arrival of loads, as well as tare and total weight.

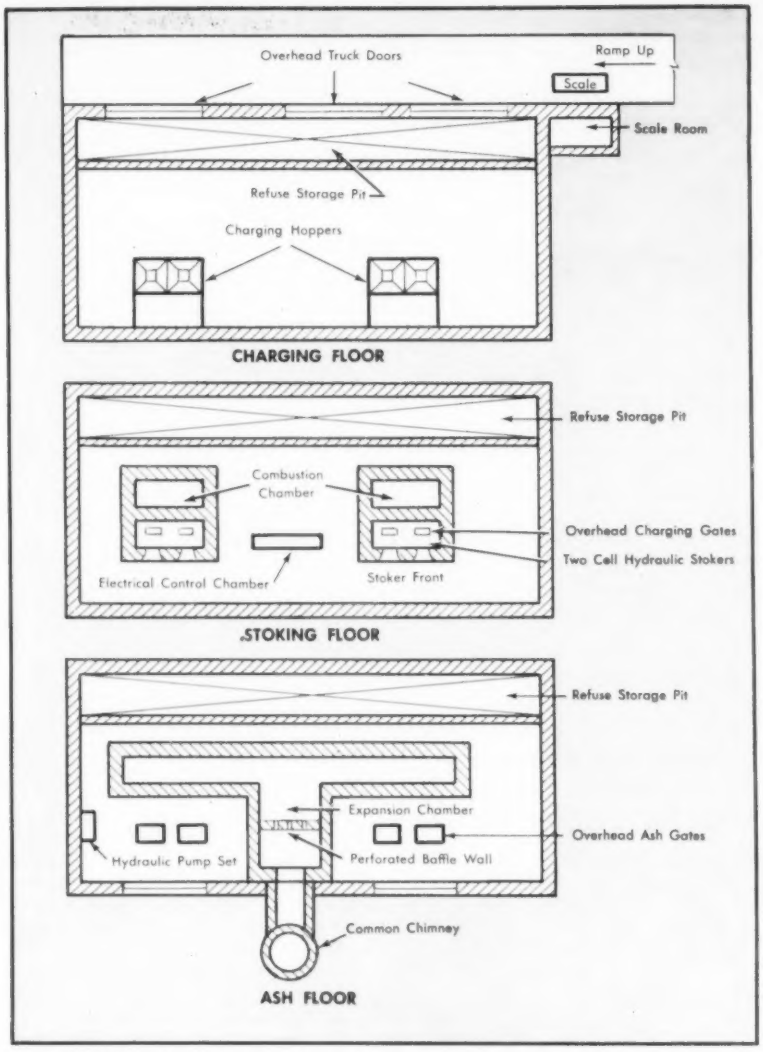


● **SECTION through East Hartford incinerator showing essential features of plant.**

Suspended over the pit and charging hoppers, a Harnischfeger traveling type bridge crane is equipped with variable speed motors for operation of the bridges and the trolley and for raising, lowering, opening and closing the bucket. A Blaw-Knox grab bucket having a 1½-cubic yard capacity takes from the bin and feeds into two double charging hoppers equipped with back stops. These back stops insure that the refuse dumped from the bucket passes into the hoppers and does not spill onto the floor from which it would have to be hand shoveled back into the hopper.

The main electrical control panel and power distribution center is located between the furnaces. A switch board controls the power feeding, the bridge crane, the forced draft blowers, the overfire air fans, the oil burners and the duplex hydraulic pump set. It also contains the pyrometers for indicating furnace temperature and the master interior communication station. This is a unit of the complete interior communication system which is provided to permit discussions and orders from the three operating floor levels and the scale room.

In addition to the indicating pyrometers on the stoking floor control center, recording type chart py-



● **THREE floor levels of the plant: Charging above, stoking center, ash bottom.**

rometers are located in the scale room to record continuously furnace temperature. The indicators on the control board and the recording units in the scale room are in parallel, being operated from one thermocouple in the roof of the furnace chamber. During operations this furnace temperature is maintained between 1500 and 1800 degrees F. Controls were furnished by Minneapolis-Honeywell.

The refractory construction is as follows. All arches on the units are 9-inch flat, suspended from overhead steel. The entire unit is steel encased with 9-inch high refractory throughout, except for the furnaces where super-duty refractory materials were used. Refractories were furnished by National. The arches are Laclede-Christy.

As this plant is constructed adjacent to a residential area and near the center of the city, air pollution and emission of matter from the stack had to be kept to a minimum. Also, the chimney height was limited to a maximum of 100 ft. due to the proximity of the local United Aircraft airport. This restricted chimney height eliminated the possibility of obtaining wide dispersion of chimney fly ash. Also, the local topography indicated that residential housing would be located within 400 ft. of the chimney, and that the elevation of the top of the chimney and of these homes would be about the same, which made fly ash a special problem.

To overcome this problem, a large expansion chamber was installed to slow the velocity of the flue gases and permit large particles to drop out of the air stream. Also, and most important, a refractory brick baffle wall with perforations measuring 2½ inches square was constructed across the center of the expansion chamber. The area of these perforations was balanced after operations began so that just sufficient draft was maintained in the fire box of the stoker to provide safe operations.

This perforated wall extending the full height of the expansion chamber stops the fly ash and particulate matter from reaching the chimney and creating air pollution problems. In actual practice this has proven effective, as chimney emissions, as observed by the local authorities and the consulting engineers, has been satisfactory.

The hydraulic stokers are of the inclined grate type with hydraulic dumping grates, manufactured by Flynn and Emrich Co. The Beaumont Birch charging gate is also hydraulically operated by 4-way valves, with its source of hydraulic power being taken from the stoker pumping set.

The area of the stoker surface is 144 sq. ft. per furnace. This provides a design rating of 59 lb. of garbage per hour per sq. ft. of grate surface. In actual operating practice, an average of 70 lb. of material is normally incinerated per sq. ft. of grate surface.

The general design of the plant was made by Nyland Company of New York and this firm also were the constructors. John P. Legnos Associates of Hartford were consulting engineers. George Penney is Commissioner of Public Works of East Hartford. The construction cost was $2550 per ton of capacity. Design provided, per ton, 13 cu. ft. of furnace chamber volume, 17 cu. ft. of combustion chamber and 27 cu. ft. of expansion or settling chamber capacity.

● **REAR view of plant. Discharge from chimney is barely visible at top right.**

Field Inspection of CONCRETE

C. E. PROUDLEY,
Chief Materials Engineer,
North Carolina State Highway Commission

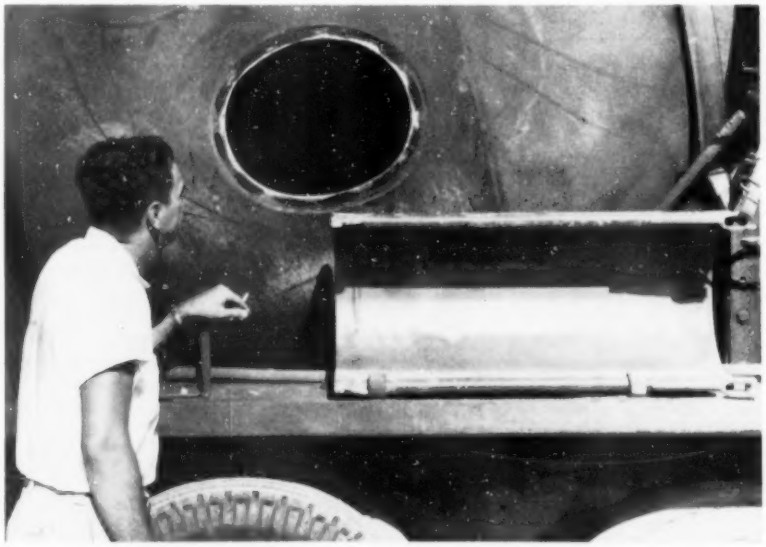
THE QUALITY of Portland cement concrete depends upon the attitude of the Producer or the Purchaser of the concrete, or both. A Producer who is thoroughly quality-conscious need no inspection other than his self-imposed controls but will cooperate cheerfully in every way with inspectors representing the Purchaser. Under any circumstances it is safest for the Purchaser to supply some degree of inspection on the assumption that some of the Producers will need it. If there is no inspection or control on the part of either, anything can happen—and frequently does.

Highway Departments, being large users of concrete, usually have their own Inspectors on the job. Inspectors assigned to concrete work should be trained by competent engineers in their duties and for this purpose the Division of Materials of the North Carolina State Highway Commission has a highly trained staff. Six Concrete Technicians travel from job to job beginning shortly after the first word of award of a contract involving the use of concrete. These Technicians confer frequently with each other and with the Chief of the Concrete Laboratory in order that all may apply the interpretation of specifications and special instructions uniformly throughout the State. Close liaison is maintained with the Bridge Construction Engineers and the overlapping of interests and authority has been found to result in higher quality of end product without friction or confusion.

There are quite a number of projects that still use concrete mixed in a stationary mixer at the job site and there are many advantages, also disadvantages, to job-mixed concrete. Inspection is much simpler. Aggregates may be sampled, tested and approved as they arrive at the site and there is no question as to what the source of cement will be. Weighing, mixing and handling equipment can be checked completely and there is little likelihood that substitutions of materials or equipment will be made before the job is started. Rate of availability of mixed concrete is a fairly definite factor in the progress of the work and desirable adjustments of the concrete proportions can be made quickly before any considerable amount of concrete is delivered to the forms.

Approval Of Ready-Mixed Concrete Plants

More than 90 percent of the concrete used in highway structures in North Carolina is furnished by ready-mixed concrete operations. No ready-mixed concrete plant may supply concrete for State Highway work until it has been approved by the Division of Materials. A list of approved plants is available to anyone interested and the list is revised every two or three months. Plants are rated on the basis of compliance of equipment with specifications using ASTM C 94, plus some special provisions of our own, as the basis. A further classification is made of each plant depending upon the qualifications of some designated plant employee in the art of satisfactory control of concrete and evidence that he is using his ability conscientiously. Thus there are A and B plants on the basis of equipment; the A plant meeting specifications in every respect and the B plant having only minor deviations considered to be negligible if the plant is operated in such manner as to produce acceptable concrete under adequate supervision. Based on type of inspection required at the plant there is the "1" which has a Certified Concrete Technician, registered by the State Highway Commission, on duty at all times during supply of concrete to State Highway work, and "2" when a State Highway Inspector must be on hand at the plant before any concrete can be



● **INTERIOR of mixer drum must be examined for accumulations of concrete, worn or loose blades, leaking valves and other defects that might affect concrete quality.**

batched out. In addition, the list of Approved Ready-Mixed Concrete Plants shows the number of approved transit mixer trucks or agitators and the capacity of each as a matter of information and a guide in planning the rate of delivery of concrete to the job-site in question. Most plants are currently classified as "B-2" but the number of "A-1" plants is steadily increasing due to the obvious advertising advantages of such a designation.

When requested to approve a plant one of the State Concrete Technicians visits the Manager and makes a tour of the facilities. Standard Specifications are discussed and the State's materials inspection services are explained. With a check list in hand the Technician and Manager start with the stockpiles, go through the batching tower and wind up with a detailed examination of every mixer, inside and out. Items found to be faulty or in need of adjustment are pointed out to the Manager and a copy of the check list left with him as a reminder of what to do to have the plant put in acceptable condition. A second inspection is usually necessary before final approval. Such approval is continued only so long as the plant is maintained in acceptable condition. Occasional checks are made, usually just before the plant is called upon to supply concrete for State work. If found to be out of line in any respect it is removed at once from the list and notice sent to all concerned.

Free Materials Inspection

Most of the ready-mixed concrete plants now avail themselves of the aggregate inspection services offered to them by the State Higway Laboratories in the interest of facilitating progress of State Highway work. The State maintains constant inspection at all commercial sources of supply of fine and coarse aggregates. RM Concrete plants which order aggregates "to meet State Highway Specifications" are shipped materials that are approved before shipment. Records are kept of the quantities shipped and the dates to each plant but it is not required that the plant use the materials for State work only.

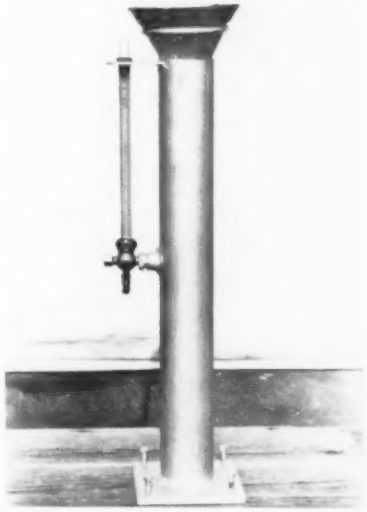
Few, if any, plants purchase all of their cement from one source and once the bulk cement is unloaded into the storage silo there is no easy way to ascertain which shipment is being batched out. The flow of any type of granular materials through a bin depends upon the sequence of the additions, the rate of the additions and the rate of discharge; much blending is possible. Two-quart sample cans are furnished every approved RM concrete plant and instructions given to fill the can with cement from the car before unloading. These cans are marked with identification to tie them in with the shipments. When concrete is batched for State Highway work the last two cans filled with samples are picked up by the Inspector and sent to the central laboratory for tests. Not more than four samples are kept on hand at the plant and the oldest are discarded. Although this does not insure testing of the cement actually going into the work in every case, the probability is good and since this procedure constitutes spot checking of the cement shipped from all mills to plants on the approved list it provides, indirectly, a safeguard against questionable cement being used. Experience has shown that the check testing method rather than pretesting results in a very low risk in North Carolina. Test reports are sent to the RM concrete plant, the cement company and the highway engineers concerned. The cement mill's bin test reports for every car shipped are sent to the State Highway laboratory and filed with the laboratory's companion reports.

Start Of Concreting On A Job

Every effort is made to have a Concrete Technician from the Division of Materials on hand for the first "pour" on each new job, in fact, an inspection of the plant is usually made the day before in order to assure proper preparations and equipment both at the RM plant and on the job where the Contractor, who is really the Purchaser, has certain obligations. Instructions are given the Inspector on the job in the proper method for selecting samples of concrete for making test specimens, curing, storing and shipping the specimens, and the other tests for control of quality, especially consistency and, in some instances, air content. Records of time of arrival of the trucks, number of revolutions of the drum as shown on the counter, and whether any additional water was needed, are kept by the job Inspector since he will be present for all concrete work on the job. These data are recorded on the truck delivery tickets or on special forms provided by the laboratory for the purpose. The Concrete Technician makes a report on a form provided for his use which includes other information about the job which is of importance to the Division of Materials for the permanent files.

The first item of inspection immediately before beginning batching is the determination of the water content of the fine aggregate and, sometimes, the coarse aggregate. Several devices are used by the plants with the approval of the Technician. The "Sand Moisture Tube" is a 3-in. diameter tube about 20 ins. high with a graduated gauge glass on the side which reads directly in percent moisture. The gauge glasses are supplied for the range of specific gravities of sand being used; usually 2.60 to 2.62 or 2.70 to 2.72. It takes but a minute to weigh a 2,000 gram sample of the damp sand, place it in the tube which has previously been filled with water to the initial zero mark and, after stirring out all of the air bubbles, read the moisture content with an accuracy of ½ percent. So far as is known this apparatus is not marketed but is so simple that any machinist can make it cheaply.

The Technicians carry with them a "Speedy Moisture Tester" set, available from The Alpha-Lux Co., which uses only six grams of sand. The damp sand is brought in contact with calcium carbide in an air-tight container to which is attached a pressure gauge which reads directly in percent moisture. This device is used whenever there is any question about the accuracy of determinations made by other means such as the continuous moisture indicator installed in the sand bins at some plants. The drying method is used only when some skeptic does not believe in the dependability of



● **SIMPLE apparatus for quickly determining moisture in fine aggregates.**

● **KELLY BALL penetration into fresh concrete is a reliable indicator of consistency and requires a fraction of the time and effort needed for the standard slump test.**

the quicker methods. The drying method is accurate, of course, only when corrected for absorption of the sand.

Following the moisture observations the prescribed job proportions are checked. A tabulation of the proportions in terms of pounds per cu. yd. for the range of probable moisture contents of the fine aggregate is posted in the batching tower. Furthermore, if the record posted in the tower does not show that the scales have been calibrated within the past 24 hours the calibration takes precedence over servicing the job. Ten fifty-pound test weights are required to be kept available for the plant and these are used to run the calibration up through the range of batch weights that will be required. Accuracy of ½ percent is considered to be adequate. If scales are out of adjustment more than this amount and it is not possible to correct them satisfactorily, a registered scale mechanic must be called and even after he has serviced the scales they must be checked again by the Technician. The water measuring device is subject to the same scrutiny. All water must be measured and added to the mix at the batching plant. Strict orders are issued not to use wash water as a part of the mixing water and not to use wash water at all except at intervals of about three hours and then the wash water is discharged before batching out another load. This practice has been found to give better uniformity and does not result in accumulation of hardened concrete in the drum even in hot weather.

In hot weather it has been permitted to increase the water content to give the maximum slump or about one inch greater than the maximum on long hauls or when it is known that there will be objectionable stiffening before arrival at the forms. Until experience at a plant provides reasonable assurance of the behavior of the materials and equipment, it is considered good practice to mix a batch completely, or nearly so, at the plant before sending it out to the job. This eliminates the likelihood of the first batch being too wet or too dry upon delivery. The advent of "retarders" has been of great assistance in overcoming some of the difficulties frequently associated with hot-weather concreting. Their use is specified on a graduated scale with rise in temperature above 70° F.

Control Of Consistency

Although the slump is specified for all classes of concrete and the standard slump test is performed in rare cases of argument in the field, the Kelly Ball is used for control because of its speed and simplicity. One piece of testing equipment (weighing slightly over 30 lb.) and 15 seconds is all that it takes to reveal that the concrete is or is not within the range of uniform consistency. It is not usable if the consistency is more than a 5-in. slump because beyond that point it becomes insensitive and may sink out of sight. The ratio of slump to Kelly Ball penetration is, for practical purposes, two.

The rapidity with which the ball penetration test can be made permits easy checking of the uniformity of mixing in a mixer, whether stationary or transit. When checking the performance of a questionable mixer at the plant or after its arrival at a job when the minimum number of revolutions (70) have been completed, a Kelly Ball penetration test is made when one-fourth of the batch has been discharged and again when three-fourths of the batch has been unloaded. If the slump as indicated by the ball test varies more than one inch between the quarter points of the batch (the standard requirement is "not more than 2 inches")

● **STANDARD slump test is performed only as an initial check of consistency in order to calibrate the Kelly Ball for use throughout the remainder of the work.**

the mixing unit is scratched from the approved list of the plant's equipment.

Time and temperature affect the consistency importantly and in some cases the number of revolutions of the drum will be a factor. Although infrequent, there have been hauls of 28 miles when atmospheric temperature was near 95° F and concrete temperature even higher without the use of a retarding agent and the concrete was successfully vibrated into place after a total elapsed time of 65 minutes. The average time, however, is about 35 or 40 minutes over a distance of about 5 or 6 miles and approximately 140 total revolutions of the drum including both mixing and agitating speeds. The Concrete Technicians are authorized to require or limit the amount of mixing, limit the length of haul, regulate use of retarders and adjust the amount of air-entraining agent and any other factor pertaining to the ultimate quality of the concrete, including the methods for curing.

Inspection At Job Site

Beginning with the first arrival of concrete at the job, it is noted that the truck mixer is one of those approved for use. Immediately before the concrete is discharged the reading on the revolution counter is observed and if it has not reached the minimum number of 70 for most mixers, and more in those cases where it has been previously determined that the inefficiency of the mixer requires more, the mixer stands until mixing is complete. The number of revolutions on the counter when discharge is started is recorded and thereafter some attempt is made to have approximately the same number for that truck on subsequent trips. Little trouble is experienced in this matter provided the scheduling of delivery is proper with no long delays between arrival of trucks and no bunching of trucks with consequent long standing and agitating before discharge. Irregular service is noted in comments on the Concrete Technicians report and counts as a demerit should any question of continued approval of a plant arise. In fact, plants have been removed from the approved list because of persistent carelessness in servicing of jobs.

It should be noted here that although it is not the responsibility of the Inspector or Technician to arrange the schedule of delivery of concrete, he is instructed to ascertain from the Contractor and the RM concrete plant that a satisfactory understanding exists so that there will be no detriment to the quality of the work because of cold joints, non-uniformity of consistency, inadequate time for placing and finishing operations or other factors that could be controlled by use of foresight.

● **SAMPLE is taken from end of chute when batch is about half discharged. A 5-gallon bucket holds enough for three 6"x6" test cylinders or one 6"x6"x30" beam.**

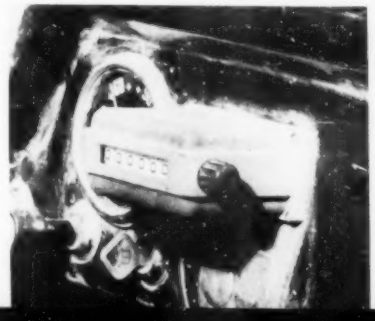
The first concrete to come from the truck is observed and if any dry material or a considerable quantity of segregated concrete issues it is taken as an indication of worn or broken blades, improper charging of materials into the truck or insufficient mixing time for that truck and steps are taken to correct the condition even though it requires rejection of the truck's use for the days' pour.

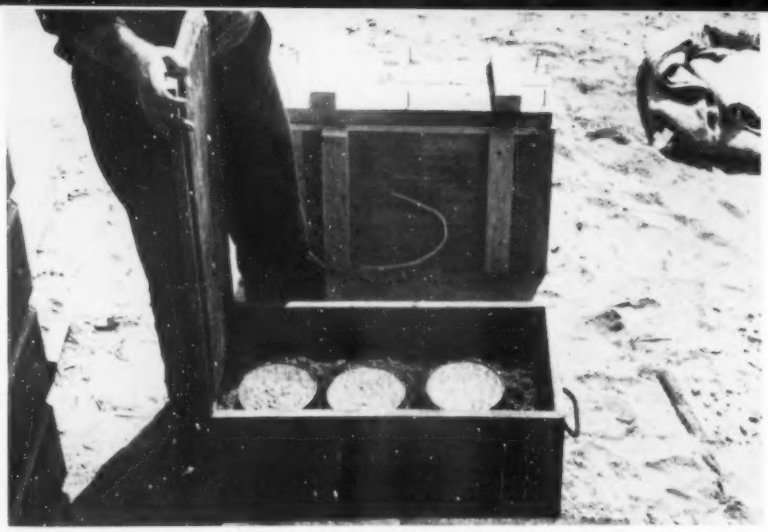
Assuming that the concrete appears to be all right, as will usually be the case if operations at the batching plant have been properly attended to, a sample will be taken at some time between the first and last quarter of the batch. The sample should be taken, if at all possible, from the end of the discharge chute of the truck. A large bucket (about 5 gallons) will hold enough for three cylinders for compression tests or one 6 by 30-in. beam for flexural testing. The first sample, however, should be subjected to tests for consistency and air content, if air-entraining concrete is being used as is required for all structural and paving concrete in North Carolina. For a consistency test it is preferable to catch the sample in a wheel-barrow, buggy or other container large enough to allow an immediate test with the Kelly Ball. Sometimes it is necessary to make the consistency test after the concrete is in the forms.

Testing For Entrained Air

It is generally assumed that the most accurate method for checking air content is to use the pressure meter. This consists of a 1 5 cu. ft. vessel filled with fresh concrete, sealed airtight and subjected to a definite air pressure thus causing a measurable change in the volume of the air in the concrete. There are several types on the market and when they are in good adjustment and used by an experienced technician the results are truly indicative. In recent years in North Carolina the Techkote meter, available from Techkote Co., has been favored by the Concrete Technicians because of its compactness and ease of cleaning. During the past season the four Technicians assigned to inspection of structural concrete have been making a study of the relationship between the standard air meter results and the values determined by the Chase air meter known also as the "AE 55". This is a small, glass tube in which a quantity of the

● **ELECTRICAL counter in truck cab shows number of mixer drum revolutions.**





● **THIS SET of test cylinders, stored in the molds for 24 hours, is about to be removed, packed in damp sawdust in box at the rear and sent to the laboratory.**

mortar from the concrete is measured and placed, following which it is filled to the zero mark with isopropyl alcohol, shaken vigorously and the air content of the mortar read directly on a graduated scale on the narrower portion of the glass tube. A correction factor converts this to air content of the particular proportions of concrete being tested. It is quick, simple, clean, very compact and has been found to be surprisingly accurate. For the benefit of those who may try it there is a cardinal rule for its manipulation: Do not touch the rubber stopper after the alcohol has been adjusted to the zero mark.

If the air test shows a value between 4.0 and 5.5 percent it is recorded and no effort made to adjust the air content although all designs are based on 4.5 percent. Several additional check tests are made on subsequent samples or batches. If outside of this range the air-entraining agent is reduced or increased slightly at the plant and further tests made. No radical adjustments are made for it is more likely that some error has been made in performing the test or handling the A-E agent in batching than that the designated quantity is seriously at fault. Jumpy air test values call for some detective work by the Inspector. All test values are recorded and reported since they will frequently explain erratic strength test values.

Specimens For Strength Tests

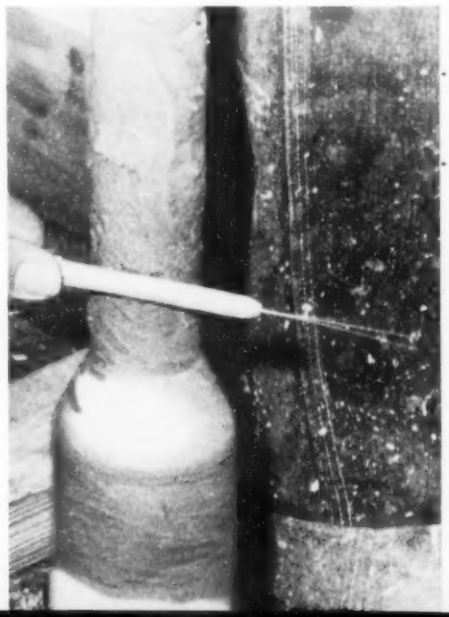
Instructions interpreting the standard methods of preparing concrete specimens for strength tests have been prepared in simple form with illustrations and these are distributed by the Concrete Technicians to the job Inspectors in person after a demonstration of the procedures to be followed for the particular job at hand. Many reliable and interested Inspectors have been trained in this way.

It is especially emphasized that the specimens are to be protected from moisture loss and temperature change during the first 24 hrs. by making and storing them in a suitable box provided for the purpose. When removed from the molds and box, the specimens are immediately placed in either one of two curing conditions: 1) as nearly 73.4°F. ±3°F. and continuously wet as possible in the field, for the purpose of determining whether the concrete mix design is adequate to provide the strength specified; or 2) in a box of damp sand or sawdust which is kept at the temperature prevailing on the job so that, when tested, the specimens will tell whether the strength that has been developed by job conditions is that which is necessary for placing the structure into service. In the first case the specimens are shipped to the testing laboratory as soon as it is possible to do so without damage to the specimens so that they will be handled under standard laboratory conditions for as much of the curing period as possible. In the latter case the specimens are kept at the jobsite as long as possible before shipping to the laboratory.

Vibrated Concrete

Most jobs use vibration for the placement of concrete, both for pavement and structures. To take greatest advantage of the benefits of vibratory placing the concrete should have a relatively low slump. But if the slump is low (dry concrete) and the vibrator is not functioning properly there will be objectionable honeycomb, therefore it is necessary to check the performance of the vibrating equipment from time to time. Frequency and amplitude are the important factors and the first is easily determined with an inexpensive device, the Vibra-Tack, available from Martin Engineering Co., which uses the vibrating reed principle. By placing the instrument, about the size of a pencil, in contact with the flexible connection not far from the spud and sliding the vibrating wire slowly in or out of the tube the frequency can be read on a graduated scale in a matter of seconds. The amplitude is not so simple to measure and the Concrete Technician's experience, observations and personal judgment when holding the vibrator in concrete or standing on the spud as it lays on the ground in operation is the only means we have used to determine its adequacy.

The Concrete Technicians representing the Division of Materials are selected for their knowledge of concrete, their ability to apply this knowledge in practical manner without violation of specifications and, of particular importance, their personality or ability to secure cooperation without friction. This requires an original personal interest in concrete plus years of training in the laboratories followed by apprenticeship under seasoned Concrete Technicians and Engineers in the field. Frequent (monthly, at least) conferences among the field and laboratory men keep them well informed of new developments in technology and maintain uniformity of application of specifications to all State Highway work.



● **FREQUENCY of the vibrating spud is checked properly with the Vibro-tack.**

HYDRAULIC TESTING OF CENTRIFUGAL PUMPS

MEL MANN,
Works Engineer,
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IT IS BECOMING more and more common for pump specifications to call for either a manufacturer's laboratory test or a field test to determine if the guaranteed hydraulic performance has actually been met. This is a form of inspection to which the buyer is entitled since the manufacturer's quoted hydraulic performance often is a significant factor in awarding contracts. Based on power costs over a 5-year period, assuming a 1000 hp driver, a loss of only 1 percent in hydraulic efficiency can be of the order of magnitude of $3000 in added operational power costs. Where there are a group of identical pumps on a contract, the matter of efficiency becomes even more highly significant.

Besides these possible additional power costs, a field performance test which indicates that the pump is below the guarantee usually means a great deal of expense to both the customer and the manufacturer. In addition to the time consumed by both in evaluating and checking tests, there is often the expense of trying to meet the guaranteed hydraulic performance.

The number of jobs requiring either or both laboratory and field performance tests is on the increase. This is possibly because there are more large pumps being installed where power consumption and thus efficiency becomes a significant dollar and cents operating factor. Miramontes[1] reports that Pacific Gas & Electric in Central and Northern California were making more than 6000 hydraulic performance tests per year, most of which were made on deep well irrigation pumps.

The parameters which define hydraulic performance of the pump are the flow rate, the head or pressure developed and the horsepower required. Various formulas have been in common use to cover hydraulic performance, overall and pump efficiency, horsepower and power input. In the application of these formulas, care must be taken to select and use proper factors.

Head Measurements

Head or pressure is normally measured by: a) Calibrated Bourdon gages; b) mercury columns; or c) water columns. Regardless of the method used, the location and geometry of the opening in the pipe must receive careful consideration to insure accurate results.

It is important that steady flow conditions exist at the point of gage connection. For this reason, it is necessary that pressure or head measurements be taken on a section of pipe where the cross-section is constant and straight. Five to ten diameters of straight pipe of unvarying cross-section following any elbow or curved member, valve or other obstruction, is necessary to insure steady flow conditions.

Four separate pressure taps should be installed, equally spaced about the pipe, and the pressure or head at that section taken as the average of the four separate values of head. If the separate manometers show a substantial difference of static pressure, appreciably affecting the total head to be measured, then it should be recognized that it is impossible to measure the total head accurately.

Flow Rate Measurements

Accurate measurement of flow rates is often exceedingly difficult especially at actual installations since the design and layout of the pipe system rarely if ever coincides with good practice for measuring flow rates. However, pump manufacturers' test laboratories are carefully designed to insure maximum accuracy. Thus, it is most often true that laboratory tests are more accurate than field tests from the point of view of achieving maximum accuracy in flow rate measurements.

Capacity measurements can be made by one of the following methods: a) weighing tanks; b) volumetrically calibrated tanks; c) Venturi meters; d) nozzles; e) orifice plates; f) pitot tube; g) Weir; h) flume; i) propellers; j) salt velocity; k) titration.

In order to insure that improper flow conditions preceding the meter do not occur, the Hydraulic Institute recommends specific values for length of straight pipe required ahead of the meter in question. It cannot be emphasized too strongly that the surface conditions, length and geometry of pipe preceding a fluid measuring device are as important as the calibration of the device itself.

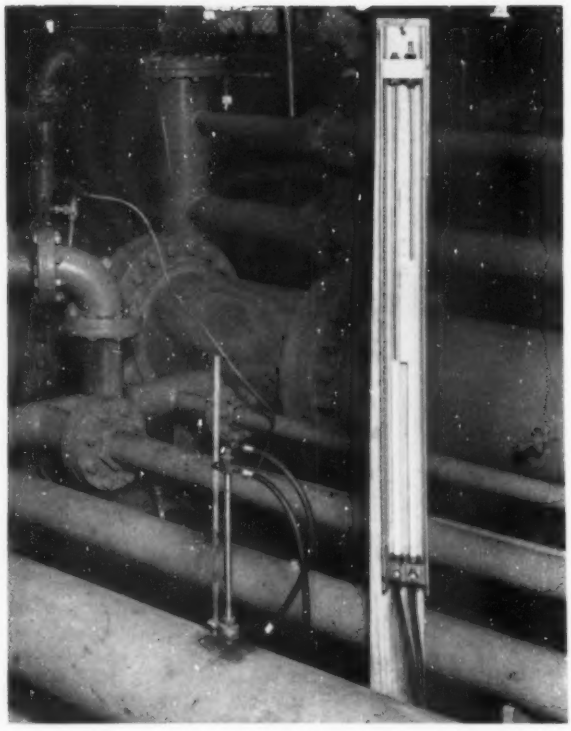
Pitot Tubes

On many field installations, the author has found it convenient to use a pitot tube to measure flow rate. Often, in a given installation, there is no accurate way of measuring capacity and the pitot tube is very convenient. It is easy to install and easy to handle; it requires very little in the way of auxiliary equipment—only a manometer, rubber hoses and scale. Techniques in using a pitot tube are relatively simple and easily learned. The tube is not sensitive to reasonable angles of yaw and a single tube can be made up for a wide range of pipe sizes. The author has used one size of tube in 4″ through 16″ pipe and a second tube for 18″ through 30″ pipe.

It is desirable to have about 10 diameters of straight pipe ahead of the pitot tube. However, if this is not available (as is often the case), three or four different traverses can be made in order to average out any disturbing flow pattern caused by an elbow or other fitting.

Accuracy Tolerances

When used in accordance with practices recommended by the Hydraulic Institute, the following tolerances on accuracy can be achieved (data except for pitot tube are taken from Standards of the Hydraulic



● PITOT tube is a convenient method of measuring flow in a pipe. Here one is being used on flow rate in an 8-in. pipe.

● EASY to install and requiring little auxiliary equipment, the pitot tube is reliable even with rather short pipe runs.

Institute): Weighing tank, ¼ of 1% for both scales and timer; volumetrically calibrated tank ½ of 1% for volume, liquid level and time measurement; Venturi meter ±¾ of 1% to ±2% if tube is rough; nozzles ±¾ of 1% to ±1%, depending on size; orifice plates ±1½%; weir ±2%; and pitot tube ±2%.

Each installation should be carefully checked to be certain that recommended practices are followed. If not followed, measurements can be either too low or too high. Also, no tolerance can be established for accidental errors of observation which often influence results and can add to the tolerances shown above.

Pressure Measurements

Bourdon type of pressure gages are reported by one manufacturer to have the following accuracy: Laboratory test gage ½ of 1% of indicated reading between 20% of full scale and full scale; test gage ½ of 1% of the scale range; and commercial gage 2% of the scale range for the middle half of the scale.

It is good practice periodically to calibrate Bourdon gages. On important tests, they should be calibrated with dead weight testers before and after the test and the average values used for the test results.

Water columns or manometers provide high accuracy for measuring head and are preferred to any other device because they are inherently capable of giving highly precise results. Care must be taken to see that: There is no air in the column of fluid; and that, when water columns are used, proper account is taken of the difference in temperature, if any, between the water being pumped and the water in the gage.

Water columns or manometers should give 100% accuracy. However, errors in observation, and fluctuation of the level normally introduce errors. Such errors can vary widely and no tolerance in general can be specified.

Speed and Power Measurements

Speed measurements can be taken by a tachometer or by electronic devices. Speed readings should be taken each time a pressure, capacity and power reading is taken to be certain of the speed at the time the other performance characteristics are being measured.

Power measurements are most often obtained by dynamometer, or by measuring power input to electric motor. Where dynamometers are used, scales should be checked against standard weights before and after the test. Also, the system should be free of all non-compensated drag. Where motors are used, power input is usually measured by watthour meters; wattmeters; or voltmeters and ammeters. A watthour meter is usually supplied and permanently installed and connected by the power company. This is a meter in which the rotational velocity of a visible disc is directly proportional to the KW load.

Determination of input KW from watthour meter disc readings will probably be the most accurate and most consistent method available in field testing. The meter itself is calibrated to plus or minus ½% accuracy. The current and potential transformers may have a combined error of plus or minus 0.3%. Add to these the personal error in timing and counting and with a little experience this method should not yield errors greater than 1%. The counting and timing error may be minimized by counting a large integral number of revolutions such as 20 or 30 and determining the time required with a stop watch.

Portable Equipment

Among the variety of portable instruments usually available for field testing there will be three general classes: a) High accuracy portable laboratory type. The voltmeters and wattmeters have electrodynamic

movements and the ammeters have magnetic vane movements. These are usually supplied with a calibration curve and if kept in calibration they may be read to an accuracy of about 0.2% of full scale. b) Medium accuracy portable instruments. The voltmeters and ammeters usually have inclined coils and iron vane armatures and wattmeters usually have electrodynamic movements. The accuracy ratings may vary from plus or minus ¾% of full scale in the better instruments to plus or minus 1½% in some of the inexpensive types. c) Hook-on instruments such as hook-on volt-ammeter and the hook-on watt-meter. Hook-on volt-ammeters will have an accuracy of about plus or minus 3% of full scale reading and hook-on wattmeters about plus or minus 5% of full scale reading.

To insure as high accuracy as possible in test results, a few simple precautions should be observed. Note that accuracy figures are given in % of full scale value. For example, on a voltmeter having a 300-volt range ½% of full scale would be 1½ volts; at 150-volts this error would be 1% and at 30 volts it would be 5%. From this it is apparent that for high accuracy results the scale ranges of the instruments should be chosen to give indicated values above half of full scale. Before energizing instruments the zero settings should be checked and properly set. In transporting instruments they should be placed either top side down or on edge. In the first case there is little likelihood of stickiness development because the jars are transmitted to the top pivot and jewel. In the second case the stresses are carried by the sides of the two pivots, and usually there is little likelihood of injuring the delicate pivot ends.

Effect of Motor Performance on Pump Efficiency

Often in both field and lab pump testing a calibrated motor is used to determine pump efficiency. If the motor is not calibrated, an assumed motor efficiency is a factor in determining pump efficiency. One must consider two sources of errors relating to motors which can effect pump efficiency besides errors in reading: a) Accuracy limits of the motor manufacturer's lab test under which the motor was calibrated; and b) conditions during calibration test of the motor may be different than those when motor is being used with pump during the performance test of the pump. Whether the motor is calibrated or not, the following can effect motor efficiency and cause the assumed motor efficiency or calibration efficiency to be incorrect: 1. Motor temperature (increased winding temperature reduces efficiency if all other factors are the same). 2. Viscosity of lubricating oil for motor bearings. 3. Thrust loads in the motor bearings. 4. Variation in voltage across motor, i.e., beyond the plus or minus 10% allowed. 5. Power factor. 6. Unbalanced phases. Unbalanced voltages applied to a 3 phase motor will adversely affect the motor operating characteristics. Motors will operate successfully where the variation in the supply voltage does not exceed plus or minus 10% of the nameplate rating, but the voltages of a given 3-phase circuit should be evenly balanced as closely as can be read on the usually available commercial voltmeter. A relatively small unbalance in voltage will cause a considerable increase in temperature rise. For example, a 3.5% voltage unbalance will cause approximately 25% increase in temperature rise. The full load speed is reduced slightly when the motor operates on unbalanced voltages. The line currents at normal operating speed with unbalanced voltages will be greatly unbalanced in the order of 6 to 10 times the voltage unbalance.

Sump Problems on Vertical Pumps

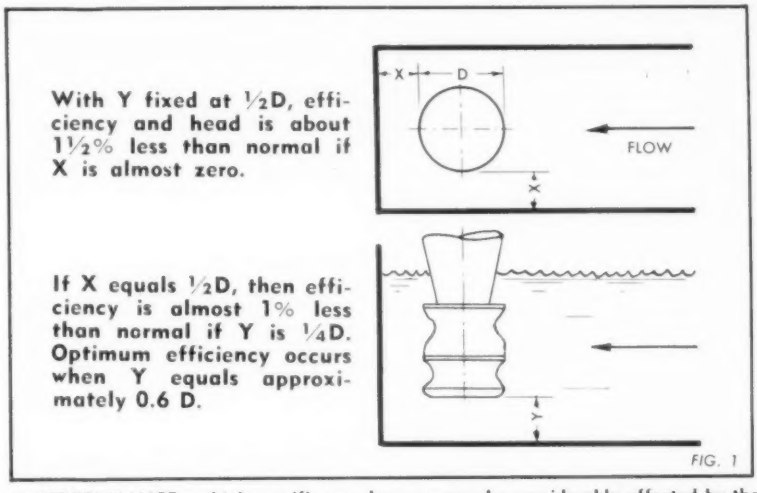
Pump performance on high specific speed pumps (say above 4000) are probably always affected to some extent by the configuration of the sump they are tested in. Work done at the University of California on a unit rated at 4000 GPM, 20 ft. head, 1160 RPM, 7800 specific speed, showed the sump design results indicated on Figure 1.

In addition to the effect of side and bottom wall locations, there can be other influences. For example, a sump such as the one shown in Fig. 2 can cause a great deal of performance trouble.

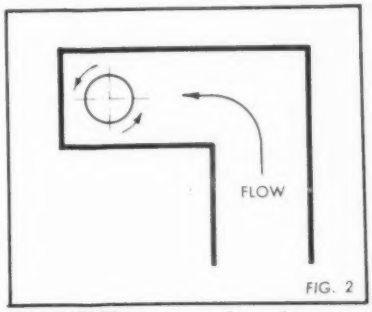
Such a sump can result in severe prerotation of the water in the approach channel. The effect of this on pump performance will depend on the magnitude and direction of the velocities involved.

Such a condition can be simulated to some extent by taking a pump and rotating the vanes in the suction bell which, of course, is located just below the impeller.

Results of lab tests with vanes rotated to various angles have been plotted. There is a great difference in performance between a 0° angle, +20° and —20° angle. At 5100 GPM, the +20° angle compared with 0° angle shows 6% greater head and 5% greater horsepower, while at —20°, the head is 10% less and the horsepower is 8% less than with a 0° angle.



● **PERFORMANCE on high specific speed pumps may be considerably affected by the configuration of the pump sump. Data above are for pump with 7800 specific speed.**



● **ANGLED sump, as shown here, may cause prerotation, affect performance.**

Performance problems caused by poorly designed sumps can be minimized if two general rules are followed: 1. Allow the fluid to approach the pump suction in a "straight" fashion; and where side walls are used, try to locate the pump properly as shown in Figs. 3 & 4. Locating the side and back walls at distances greater than shown does not necessarily make a better sump. As a matter of fact, in many cases this will aggravate a poor sump condition since the side and back walls tend to dampen vortices which form upstream from the pump suction.

There are undoubtedly many successful installations which do not follow these rules. Also, there are other factors involved such as size of pump, velocity of flow in the channel, submergence over the bottom of the channel and over the bottom of the pump, specific speed of the pump. The quantitative influence of many of these factors is not clearly understood. Where there is doubt about a given sump design, the customer and pump manufacturer should work together to solve a potential or actual problem which experience indicates can likely cause poor pump hydraulic performance.

Rate of Flow

Most pumps are driven by electric motors and it is rarely a problem to be able to measure the power input to the motor. Also, the pressure developed by the pump is normally physically easy to measure. However, on a good many installations, flow rate is difficult to measure simply because there is no instrumentation easily adaptable which will insure accuracy. In many cases, there is a large reservoir or a channel of some sort where attempts are made to measure flow rate by timing the change in level (volume) and then calculating the rate of flow. Volumetrically calibrated tanks can be a very accurate method of measuring flow rate but the tank must be calibrated. Rarely is this done for the purpose of running a pump test and there is really no reliability in this method unless the tank is accurately measured.

Pump Test Codes

The following codes cover testing of centrifugal pumps. On a given job, one of these codes should be followed where tests are involved:

A. Standards of the Hydraulic Institute (Section VIII).
B. American Standard Specifications for Vertical Turbine Pumps (Section 6):
   ASA B-58.1 - 1955
   AWWA A 101-55
C. ASME Power Test Code for Centrifugal Pumps.
D. A. P. I. Specifications (610) for Centrifugal Pumps for General Refinery Service (Section D).

When one considers all the possible sources of error particularly in field testing, it is surprising that many engineers rely heavily on results obtained from field testing. Folsom & O'Brien[6] indicate that "The results of any series of measurements include some error, the magnitude of which may be reduced through the use of more precise instruments and control equipment. The error magnitude may be appreciable (5%) when testing centrifugal pumps under field conditions with usual instruments". The author's experience agrees with this statement and recommends that whenever possible, acceptance tests on centrifugal pumps be based on factory tests and not field tests, since the error magnitude in a factory test is normally less than 2%.

● **WHEN VANES in suction bell are rotated from zero position (left) to an angle with impeller rotation (right), both head and horsepower decrease for a given flow.**

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2. A.S.A. B.58.1 - 1955 and A.W.W.A. A101-55.
3. A.S.M.E. Power Test Code for Centrifual Pumps.
4. A.P.I. Specs (610) for Centrifugal Pumps for General Refinery Service.
5. University of California; Department of Mechanical Engineering Technical Memorandum No. VI, dated December 17, 1940.
6. University of California, Department of Mechanical Engineering Technical Memorandum No. V, dated January 1940, by M. P. O'Brien and R. G. Folsom.
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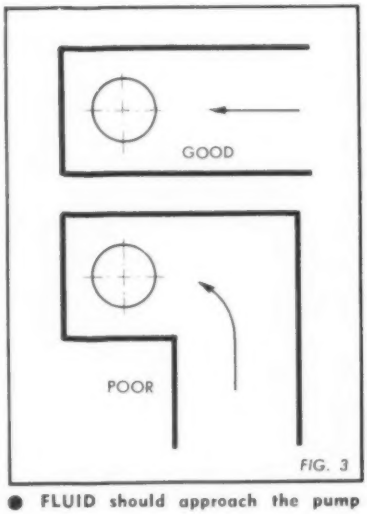


FIG. 3

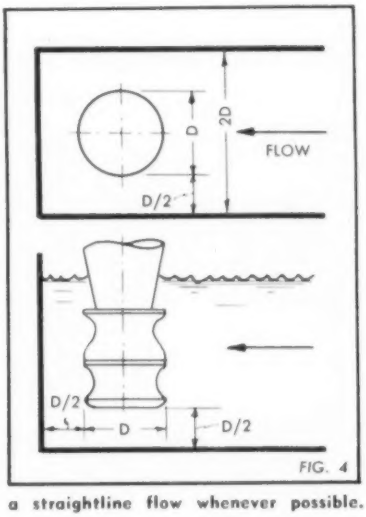


FIG. 4

● **FLUID should approach the pump in a straightline flow whenever possible.**

VELOCITY CONTROLLED SEWAGE SIPHONS

Solve Pumping Problems

THOMAS M. RIDDICK,
Consulting Engineer,
New York, N. Y.

TWO SEWAGE siphons, believed to be among the largest constructed and the first to operate on an automatic and velocity-controlled basis, were placed in active service in Peekskill, N. Y., in December, 1956. These convey 80 percent of the domestic wastes of Peekskill to the treatment plant, a distance of some 6,000 feet. In constant operation without malfunction for more than a year, the hitherto untried installation, has proved to be fundamentally sound.

The city is situated on high terrain which slopes sharply to the Hudson River. The only possible route from the central collecting point in the city to the waste treatment plant is an existing roadway located close to the river, paralleling the main line of the New York Central Railroad for about 1,500 feet. The elevation of this roadway varies from four to twelve feet above mean sea level, with the plant site at elevation 25. Pumping all sewage from the city would have been possible but would have materially increased operating and maintenance expenses and would have imposed an annual power cost estimated at $10,000 at the design rate of flow.

The installation of standard-type siphons, either twin or triplicate, would have been hazardous due to the very long length of these lines and the tendency to clog with grit and/or grease at the low velocities which prevail during minimum night flows and for a period following the second or third siphon going into service. The problem was further complicated by the difficulty of either screening or removing grit at the head-end of the siphons.

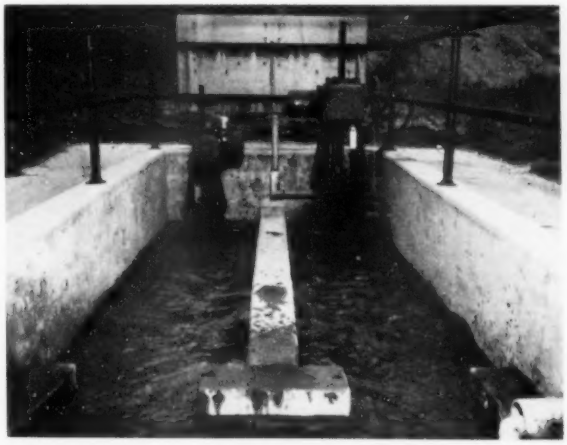
Plan Adopted

A number of basic concepts were worked through, with the plan finally adopted being 1) to construct a sewage collecting standpipe to receive wastes at a central point in the city, both by gravity and by force main; 2) to employ two siphons, 12 and 16 inches in diameter, extending from the bottom of this standpipe to the treatment plant (a run of 6000 ft.); and 3) to place valves on the ends of the lines and have them controlled by the water level in the collector standpipe so as to permit either or both siphons to be in service depending upon the instantaneous rate of sewage flow.

Since, to our knowledge, no such arrangement as this had ever heretofore been tried, the lack of precedent necessitated careful selection of materials and equipment, as well as continuous recheck of the basic design to prevent overlooking some facet which might render the installation inoperative. The collecting standpipe had to provide for positive passage of all grit from the several influent lines to the two discharge siphons, as well as for removal of scum and floating solids.

A standpipe diameter of 15 feet was selected as being minimum to provide adequate structural rigidity and storage volume for flushing the lines. Tank height was determined by the head required to pass the desired rate of flow through the siphons and also by the elevation of the gravity line entering at the top of the standpipe. The base was set at Elevation 11, (the plant site was at Elevation 25) and the top of the tank was established at Elevation 62. The tank was ringed at the top with a five-foot platform which

● **FLUSHING action of 12-inch siphon is illustrated here. The 16-inch valve has closed and the 12-inch is starting to open.**



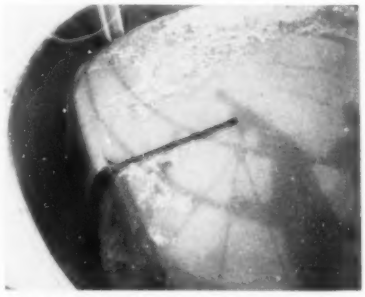
● **BOTH valves open at a storm flow of about 6 mgd. Note that high water level in the flumes limits the turbulence.**

was connected to Main Street by a 100-ft. steel girder, supporting a walkway, which in turn carried the 10-in. high level gravity sewer. This line turned downward within the tank a distance of about 30 feet, terminating in a 90° bend set tangentially to the standpipe radius so as to impart a continuously circular motion to the liquid.

The main Peekskill sewer on Central Avenue, was intercepted at Elevation 75, (about 13 feet higher than the top of the tank) and a 12-in. Class 150 asbestos-cement (Transite) line was run in city streets from this point to the bottom of the standpipe (Elevation 11). This entered the standpipe in a 2-ft. square flume formed by filleting the bottom of the steel standpipe with mass concrete. This flume diametrically crosses the tank and is flared to discharge to the 12 and 16-in. siphons, which are located side by side on 28-in. centers. Concrete fillets extend upward from this flume to a height of 15 feet, and flare outward to form a semi-conical shaped bottom section of the standpipe. This assures that all grit from the 10-in. line entering at the top of the standpipe will be carried downward to the bottom, and into the flume. The moderately high velocity in the flume created by the 12-in. Central Avenue force main then conveys this grit to the two 6000-ft. siphons.

Control Arrangements

At the waste treatment plant the pipelines terminate in a special stilling flume located at the entrance end of the grit chambers. A motor-operated valve is located at the end of each line. A Chronoflo transmitter is connected to the bottom of the standpipe and transmits water levels by phone lines to an indicator-recorder located at the plant, which controls the positioning and programming of the two valves by means of mercoid contacts in the recorder. Between liquid levels in the standpipe at Elevation 25 (the elevation of the outlet ends of the siphons) and Elevation 56, the 12-in. valve is open and the 16-in. valve is closed. This enables the smaller siphon to handle low flows up to 2.0 mgd, the limit of its capacity. At this point the velocity reaches 4.6 fps, which is more than ample to transport grit. At Elevation 56 the Chronoflo transmitter closes the 12-in. and opens the 16-in. valve. Due to the decrease in frictional resistance offered by the larger line, the liquid level quickly drops from Elevation 56 to Elevation 35, thus flushing the line with a volume of 20,000 gallons and creating a velocity in the 16-in. line of about 4.5 fps. If the rate of waste input continues to increase, the liquid level in the standpipe again rises, and at Elevation 60 (when the flow reaches a rate of 4.5 mgd) the 12-in. siphon is again automatically cut in service, and the two lines are then capable of handling a flow up to 6.5 mgd. With decreases in flow, the programming is reversed, with the 16-in. line handling rates from 4.6 to 2.0 mgd, and the 12-in. line handling rates from this point to a minimum night flow of about 0.8 mgd. Under normal operating conditions each line is therefore automatically flushed each day.



● **ROTARY motion of incoming sewage assures scum discharge over the weir.**

Scum Removal

In order to remove scum and floating solids, a 5-ft. long skimming weir (with collector compartment) is located at the top of the tank and at right angles to the radius. Flow is to an 8-in. steel pipeline set vertically in the tank, which discharges to a small pumping station located alongside the tank. This station handles about 15 percent of total sewage flow, representing collection from the low-lying streets situated along the river front. Since overflow liquid containing the scum and floating solids drops vertically about 50 ft. through the 8-in. steel line, the velocity is in excess of 35 fps. The effluent end of this line is directed toward a checkered steel plate set in the receiving manhole and the high velocity serves effectively to macerate the floating solids.

The tank is skimmed once or twice a week by simply closing both the 12-in. and 16-in. valves located at the ends of the siphons. This causes the liquid level in the tank to build up to the height of the weir (Elevation 60.5) at which overflow occurs. Since a liquid-level recorder is located on the main panelboard at the plant, the operator is always aware of the level in the standpipe, and the skimming operation can therefore be performed from the plant. The discharge of the scum and floating solids to the pumping station raises the liquid level in the collecting basin and causes one or more pumps to cut in service. These discharge directly to the 12-in. siphon extending to the treatment plant.

It is obvious that an untried design of this type required the utmost care in construction as well as in selection of materials and equipment. If the liquid level indicator and/or Chronoflo transmitter failed to perform consistently, the tank would overflow. The Limitorque motor-operated valves located in the open at the end of the lines receive hard wear since they operate many times daily. The pipelines were critical from many standpoints.

Siphon Design

A great deal of consideration was given both as to size and type of pipe to employ for the two 6,000-ft. siphons. The smaller size was selected as 12-in. to provide a minimum velocity of about 2 fps at night flows, with a 16-in. size chosen to provide for a combined flow of 6.5 mgd.

It was necessary to select a pipe with a high initial flow coefficient so as to permit attainment of maximum velocity with minimum friction losses. It was also essential that this coefficient be maintained for the life of these lines. The maximum head available was, of course, set by the 10-in. line from Main Street, which permitted the tank height to be carried about 35 feet above the elevation of the terminal ends of the siphons. It was necessary that the pipe material (or pipe lining) be resistant to corrosion and to gases, such as hydrogen sulfide, which could be formed if sewage became septic in transit. The only roadway for these lines necessitated laying them within 10 to 20 ft. of the main line of the New York Central Railroad for a distance of about 1500 ft.; therefore a relatively high degree of joint flexibility and resistance to vibration and shock was necessary.

The roadway was quite narrow and, for a considerable length, was built on rock cut. Test drillings showed the rock-line to be high, permitting a cover of only 18 to 24 inches for a distance of about 800 ft. Although this is a secondary road with little traffic, it is subject to traverse by coal, oil and sometimes concrete trucks. With so little cover, the crushing strength of the

pipe had to be considered. The roadway was initially constructed by the New York Central Railroad as an access-way, and the roadbed had been surfaced with cinders. This, of course, created the hazard of electrolysis if metal pipe were employed.

Asbestos-cement pipe (Johns-Manville Transite) was finally selected as having a maximum of desirable quality and a minimum of drawbacks. We were however initially fearful of using this material because of road shock. The manufacturer was therefore contacted, and a series of field tests were made to evaluate this hazard. A length of 12-in. and a length of 16-in. Class 150 pipe were buried in a trench four feet wide, of depth only sufficient to afford a cover of about 20 inches over the larger sized pipe. Spacing between pipe was set at 28 inches which would coincide with laying conditions. The ends of the pipe were sealed, and the trench was backfilled according to our standard specifications, which require hand-tamping to an elevation equal to the center-line of the pipe, with bulldozing permitted from this point to grade. A two-wheel rubber-tired dolly was then fitted with a steel tank loaded with water to provide an axle load of ten tons. For test, about a dozen passes were made with the dolly moving transversely to the pipe, and about a dozen along the axis of trench. In order to produce impact, a 4-in. x 12-in. timber was then laid alongside the trench and the dolly again transversely run over this a number of times at a speed of 10 to 15 miles per hour. These tests were judged to be more stringent than conditions imposed on actual pipe service. The pipes were then unearthed and tested in the laboratory. Strengths proved to be normal and the recommendation was made that this pipe be employed. No breakage has occurred in over one year of service.

Equipment Selection

A Builders-Providence Chronoflo transmitter and water level recorder installation were selected for control equipment. It was realized that the opening or closing of a single valve in response to changing water levels is quite common practice and a relatively simple operation. However, the programming of two valves —one to open and the other to close when the liquid level reaches a specific height, plus the required opening of both valves at a still higher elevation, and the necessity for proper valve functioning both on increasing as well as decreasing rates of flow—introduced some complexities which were not fully appreciated until actual completion of the job. Such programming also created divided responsibility between the manufacturer of the telemetering equipment; the manufacturer of the valve operators and the valve manufacturer. Although a few "bugs" in circuitry developed initially, these were quickly ironed out and the installation has been completely successful.

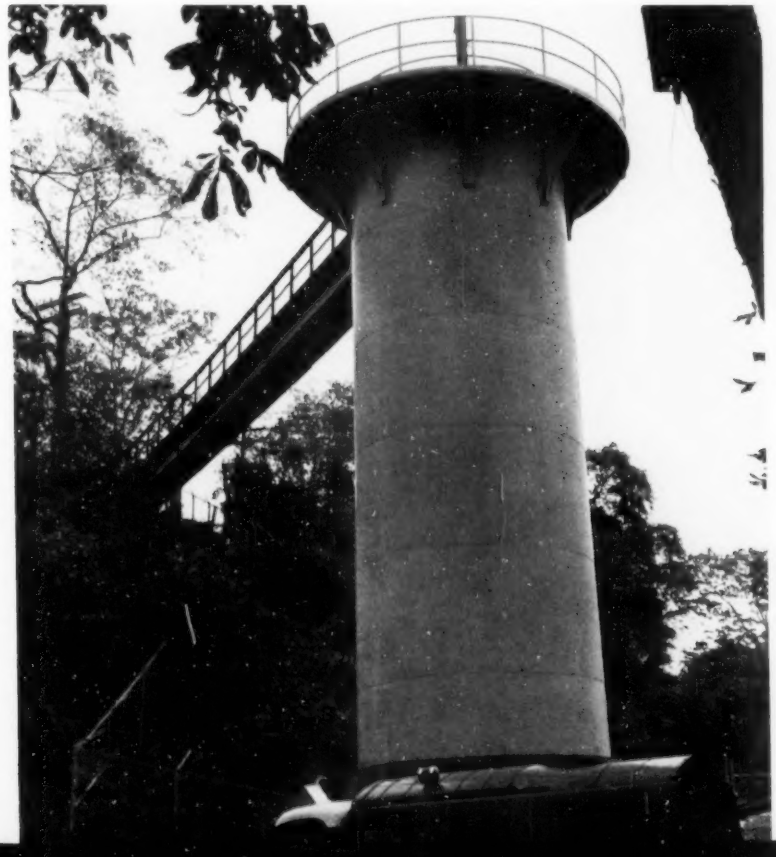
The terminal gate valves are naturally subject to hard wear as they open and close a number of times daily. It was essential that they be able to perform without chatter or vibration which would cause wear, as they (or their successors) will be in service for the life of the plant. Rensselaer square bottom valves made by Ludlow Valve Manufacturing Co., were selected, and special drain lines were located beneath the disc seats to remove grit which might otherwise prevent positive closure.

It is not believed that these pipelines will clog, but against such occurrence several safety provisions were made: a) Each line can be backflushed with the flow from the line in service (there are two blow-off points along the route; b) each line can be backflushed from the plant end with 700 gpm of water at a pressure of 100 psi (hose connections are in place); c) the exact location of the line is identified each 1000 ft. with concrete posts set above the snow-line, and at these points $\frac{3}{8}$-in. copper tubing enables the attachment of a pressure gauge to locate the point of clogging.

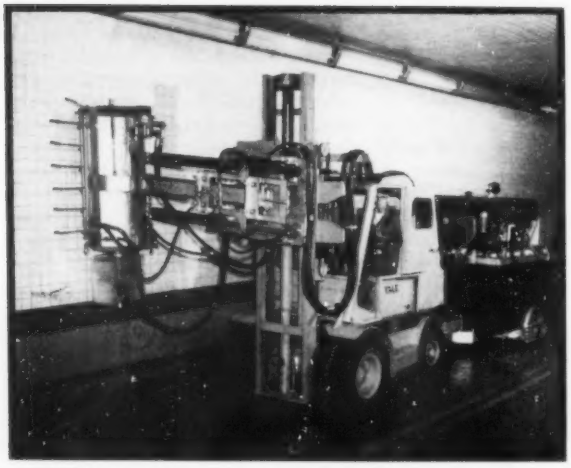
It is believed that this installation shows that siphons (or odd type force-main-siphons) can be effectively installed as very long transmission mains and that grit and scum may be successfully handled in such lines provided valves are employed to assure a flushing velocity in each main daily.

Acknowledgements

I wish to express my sincere appreciation to the Contractor, Villard Contracting of Hastings-on-Hudson, New York, and to the several equipment suppliers above mentioned for their excellent cooperation and hard work. I also express my thanks to the city officials of Peekskill and to J. Wilbur Irish, Consulting and Resident Engineer who went along with what seemed at times to be a Goldbergian installation.



● **STANDPIPE, showing the 100-foot long steel footbridge which carries the 10-inch high level sewer from Main St.**



● TUNNEL washer uses revolving brushes mounted on boom. Detergent and water are pumped from tank on trailer.

● BOOM carrying the brushes can be rotated through arc of 180° permitting scrubbing the arched ceiling thoroughly.

UNIQUE WASHER CUTS TUNNEL MAINTENANCE COSTS

PHIL HIRSCH

AN INGENIOUS washing machine has enabled officials of Mobile, Ala., to reduce by nearly 90 percent the cost of cleaning the Bankhead Tunnel, which carries traffic under the Mobile River into the center of the city. Savings total more than $5700 a year.

The patented washing equipment was designed by the Ross and White Company, Chicago, in collaboration with Palmer and Baker, consulting engineers to the city of Mobile. Basically, the equipment consists of one or more revolving, cylindrical brushes mounted on the front of a Yale and Towne 6,000-lb. capacity lift truck. The brushes scrub the walls and ceiling of the ceramic-tile surfaced tunnel immediately after a detergent-water mix has been applied. Afterward, the tile is rinsed with clear water. Both the detergent mix and the rinse are applied automatically through spray nozzles mounted on a rectangular metal frame that surrounds the brush housing. The nozzles are connected by flexible hose to storage tanks installed on a trailer hitched to the rear of the lift truck.

Only two workmen are needed to operate this washing rig; before it went into service about a year ago, a six-man crew was employed. Besides reducing labor costs, the equipment also makes it possible to wash the tunnel much more frequently. Dirt accumulation has been reduced considerably, reports Operating and Maintenance Engineer T. Gaines St. John, increasing the brightness level inside the tunnel "at least 20 percent."

The Bankhead Tunnel, 3,389 ft. long overall, was built in 1941 at a cost of some $4 million. Since then, more than 43 million vehicles have passed through it. Current volume is approximately 3 million vehicles annually. The tunnel is a part of Alternate US Route 90, a major east-west arterial highway. Formerly, motorists using Alt. 90 had to drive some 7½ miles out of their way, through congested streets to cross the Mobile river at a narrow drawbridge north of the city's center.

The tunnel consists of a reinforced concrete tube 2,000 ft. long, laid a maximum of 47 ft. under the river. There are rectangular steel bent sections at either end with a total length of 1109 ft. that connect the tube with open approaches having a combined length of 280 ft. Maximum height of the ceiling above the 21-ft. two-lane pavement is 17 ft. 10 in. The area cleaned by the washing rig (i.e. walls and ceiling of the tube and bent sections) totals approximately 162,000 sq. ft.

The six-man crew formerly used for tunnel-cleaning operations performed the job with the aid of an oil-fired boiler mounted on a four-wheeled cart—towed by a maintenance truck. A fire hose, paid out as the crew moved through the tunnel, supplied fresh water to this boiler, which heated it into steam. The steam, after being combined with a detergent-water solution, was fed through flexible hose to a metal spray pipe. The steam and detergent removed grime from the ceiling of the tunnel adequately, but two members of the maintenance crew, using long-handled brushes and additional detergent mix, were needed to complete the job on the walls.

The crew required five weeks, working an eight-hour shift five nights a week, to clean the tunnel. By comparison, the truck-mounted

washing machine scrubs tunnel walls and ceiling in two six-hour work shifts. Equally important, only two men are needed, instead of six.

Significantly, there has been no increase in consumption of detergent, reports Supt. St. John. Despite the shorter cleaning interval, the tunnel still requires only about five drums of cleaning liquid (275 gallons) per year. He believes this increased utilization is due to the greater cleaning efficiency of the Ross and White equipment, as compared to the manual methods formerly employed.

Cleaning Crew

The crew formerly used consisted of four common laborers, paid 75 cents an hour, and two regular members of the tunnel maintenance force, who received $2.60 an hour. Thus, the crew's wages came to $8.20 an hour. To complete the tunnel-cleaning job required a total of 200 working hours (8 hrs. x 5 nights x 5 weeks); thus, total cost of the labor involved came to $1640. The tunnel was cleaned four times a year, so the annual wage bill totalled approximately $6500.

Each of the two men now used—one drives the lift truck, the other acts as flagman and diverts traffic around the rig—is paid $2.60 an hour. Their wages, for the 12 hours they spend cleaning the tunnel, come to $62.40. The tunnel is now cleaned once a month, so the annual wage bill is approximately $750. This means a saving of $5750 annually.

On a per-job basis, the saving is even greater. Formerly, as explained above, labor cost of cleaning the tunnel each time came to $1640. The $62.40 now spent represents a cost reduction of more than 96 percent.

The washer has eliminated the need for employing the four common laborers. Also, the two regular members of the tunnel-washing crew now have time for repair work, painting, scraping, and other duties that wasn't available before.

The tunnel is much cleaner, since it is scrubbed once a month instead of once every three months. The higher light level has improved driver visibility, especially during rush hour periods. During these two traffic peaks, some drivers must look into the sun as they approach the tunnel (which is laid in an east-west direction). Formerly, these drivers needed some time for their eyes to adjust to the much lower brightness level inside the tunnel. Despite a modern fluorescent lighting system, the tunnel was comparatively dark much of the time because of the accumulation of deposits on its ceramic tile interior surfaces. By washing these surfaces more frequently, and in the process raising the brightness level some 20 percent or more, the difference between seeing conditions inside and outside the tunnel for drivers looking into the sun has been reduced appreciably.

The fluorescent lighting fixtures also have remained much cleaner. Formerly steam had a tendency to become deposited on the plastic diffusers under the two 6-ft. tubes comprising each fixture. Elimination of this condensation has helped, along with the brighter walls and ceiling, in producing increased lighting efficiency.

The lift truck requires approximately six round trips through the tunnel to complete the cleaning job. On each pass, a 60-105 in. swath of tile is covered. The area is determined by the number of brushes installed on the front of the lift truck. For the ceiling, a cylindrical unit 5 ft. long is employed. When the walls are being scrubbed, two auxiliary brushes are added, one at each end of the 5-ft. brush. The tunnel maintenance crew has three of these extra brushes—9, 18, and 27 in. long respectively.

Brush Bristles

These brushes, which Ross and White developed originally for portable and stationary washing equipment that is used extensively today by bus and truck fleet operators, are made of stiff nylon bristles $8\frac{1}{8}$ in. long. The brushes are still in excellent condition, reports Supt. St. John, after a year of service.

The brushes are mounted on the end of a boom attached to a metal plate on the front of the lift truck, at the place where the forks would be normally. From his cab, the operator can raise or lower this plate on the two metal shafts comprising the mast of the lift truck, or he can rotate the plate and boom through an arc of 180 deg. Through one or both of these movements he can position the brush housing on the end of the boom, anywhere on the wall or ceiling of the tunnel.

With the boom in position, the brushes can be swiveled independently up or down, right or left, permitting them to clean hard-to-reach areas. For example, along one side of the tunnel, there is a walkway protected from the roadway by a guard rail about 3 ft. high. By resting the boom on this railing, the lift truck driver can scrub most of the wall behind by swiveling the brushes vertically. The ability to rotate the 5 ft. brush horizontally, meanwhile, helps him scrub the arched ceiling more effectively.

The brushes can also be extended outward, in line with the boom, a total distance of 30 in. by operating another cab control. This action provides the pressure needed to remove accumulated grime. The pressure varies from about 25 psi. on the ceiling to about 50 psi on the walls. The relatively long length of the bristles provides a cushion which permits the brushes to "bend" around the sharp corners of lighting fixtures, fire extinguishing equipment, and other facilities installed on the walls and ceiling of the tunnel. Tile around these projections can thus be cleaned thoroughly.

Detergent mix is sprayed on the tile, ahead of the brush housing, and rinse water is put on afterward, by two sets of spray nozzles, both of which are mounted on a rectangular metal frame that surrounds the brush housing. There are seven nozzles for detergent, 14 for rinse water. The former cover an area about 18 in. ahead of the brush, while the latter reach an equal distance behind. Thus, as the lift truck moves along, at a speed of approximately 4 mph., each section of tile is first covered with detergent solution, then is scrubbed with the brush(es), and finally is rinsed, completely automatically.

The detergent used is N-L concentrate. Five gallons are mixed with 75 gallons of water for the ceiling, while a 3/77 ratio is used on the walls. Eighty gallons of solution is adequate to cover about one quarter of the tunnel's interior surface. Supplies are replenished each time the crew reaches the midpoint of the tunnel. Extra detergent is carried along, and water is obtained from a fire hose outlet.

Each set of nozzles is supplied from a tank mounted on the two-wheeled trailer hitched to the rear of the lift truck. The rinse-water tank has a 500-gallon capacity, while the one containing detergent solution holds 80 gallons. Rinse water is pumped to the nozzles by a 15 gpm. Gorman-Rupp pump, while a second unit—of the same make and rated at 2 gpm., is used for the detergent mix. Both sprays come out at approximately 35 lbs. pressure. Power for these pumps, as well as for rotating the brushes, is supplied by a 25 hp. air-cooled, gasoline-powered Wisconsin motor, also installed on the trailer.

Comprehensive Study Leads to IMPROVEMENTS OF SANITARY SEWER SYSTEM

GRANT M. HINKAMP,
Floyd G. Browne and Associates, Consulting Engineers, Marion, Ohio

A FEW years ago Ravenna, Ohio, found itself faced with serious problems in its sanitary sewerage system. There were many bottlenecks restricting the flow and an ever increasing amount of storm water entered the sanitary sewers, aggravating an already acute condition. This resulted in the flooding of basements and streets, overtaxing the capacity of the treatment plant and the frequent by-passing of a mixture of storm and sanitary sewage into open ditches. Realizing that remedial measures were imperatively required, Floyd G. Browne and Associates, Consulting Engineers of Marion, Ohio, were engaged for a comprehensive study of the system.

Ravenna, a city of 10,000 population, has diversified industries, the principal ones being in the metal working and rubber products fields. The area of the city is approximately three square miles. Its topography is rolling and the main drainage divide between the St. Lawrence and Mississippi basins lies within the corporate limits. This divide, plus several smaller divides within the main basins, complicates sewer designs. In order to bring all the sewage to one point for treatment, lift stations, force mains and siphons are needed.

Practically all of the city's sanitary sewage is collected at point "A" on the map in the southwest part of the city. From this point an 8-inch vitrified sewer pipe line and a 10-inch cast iron pipe line acting as inverted siphons carried the sewage to the plant site, passing under several main and spur lines of railroad tracks. These siphons became too small as the quantity of sewage increased with the population and as the amount of storm water entering the sanitary sewers became greater. This condition was greatly aggravated by the failure of the 8-inch line to function—due to a break or stoppage that could not be definitely located and therefore was never corrected. This siphon was the major bottleneck in the system; but there were others and all needed to be rectified.

Recommended Improvements

One of the principal items of sewer work consisted of the installation of a new 18-inch asbestos cement pipe line siphon from the principal gathering point (A) to the plant. This new line plus the old 10-inch line will have a capacity of over 4 mgd, which is the present plant capacity. The inactive 8-inch line was abandoned. The new siphon is provided with sluice gates and blow-off chambers so that it can be maintained easily. Overflows are constructed so that an estimated flow of 11.5 mgd can be removed from the sewers at the gathering point if and when required. An 18-inch overflow line can be extended as a siphon line to the plant in the future should that ever be necessary.

A considerable home building program is under way in the northern part of the city and industrial additions are being made in the northeastern portion. New sewers were needed to serve these areas, some of which had no sewers at all. Natural drainage from the northern part of the city is away from the plant site. Sewage from this area is collected in a new lift station at "B", from which the sewage is pumped to the crest of the divide and then flows by gravity to the main gathering point. The old sewer could not handle the additional increment and was replaced by a new 24 to 30-inch line.

There is some residential development in the southeastern part of the city and sanitary sewers were urgently needed there. This work had been started before the war, but had been postponed because of war conditions. To handle temporarily the sewage collected by the 1940 construction, a lift station, "C", had been built in the eastern part of the city. By 1953, this was giving some trouble. Therefore a new line of 15-inch sewer was designed to serve the southeastern part of the city and to make possible the elimination of the temporary pumping facilities. By means of a branch line this sewer also serves an area south of the railroad tracks in the extreme southeastern portion of the city.

This line has its terminus in a new lift station, "D", in the southern part of the city. Sewage collected there is pumped a short distance into a gravity sewer, which in turn has its terminus at the main gathering point, from whence it flows through the siphon to the plant.

In the southwestern part of the city there were several houses without sewerage facilities; a residential development is planned for the area, and beyond that is a possible future industrial area. These areas will be served by a new line which flows by gravity to the treatment plant site.

All the new sewers are designed to care for the estimated needs of the city in 2003 and are based on a population of 16,500 with a daily domestic water consumption of 100 gpd per capita. This figure is 75 percent greater than the average of the summer months of 1953. The higher figure was used because of the known national trend toward the increased use of water. For commercial areas 40,000 gallons per acre per day was taken as the run-off. Industrial and light commercial areas were figured at 10,000 gal. per acre per day. Infiltration was estimated to be 1,500 gad. The peak factor used varied from 2.5 to 4 times the average flow, depending on the contributing population. All sewers were designed to have a minimum velocity of two feet per second flowing full or half full.

Sewage Treatment Plant

The sewage treatment plant as it existed prior to the present im-

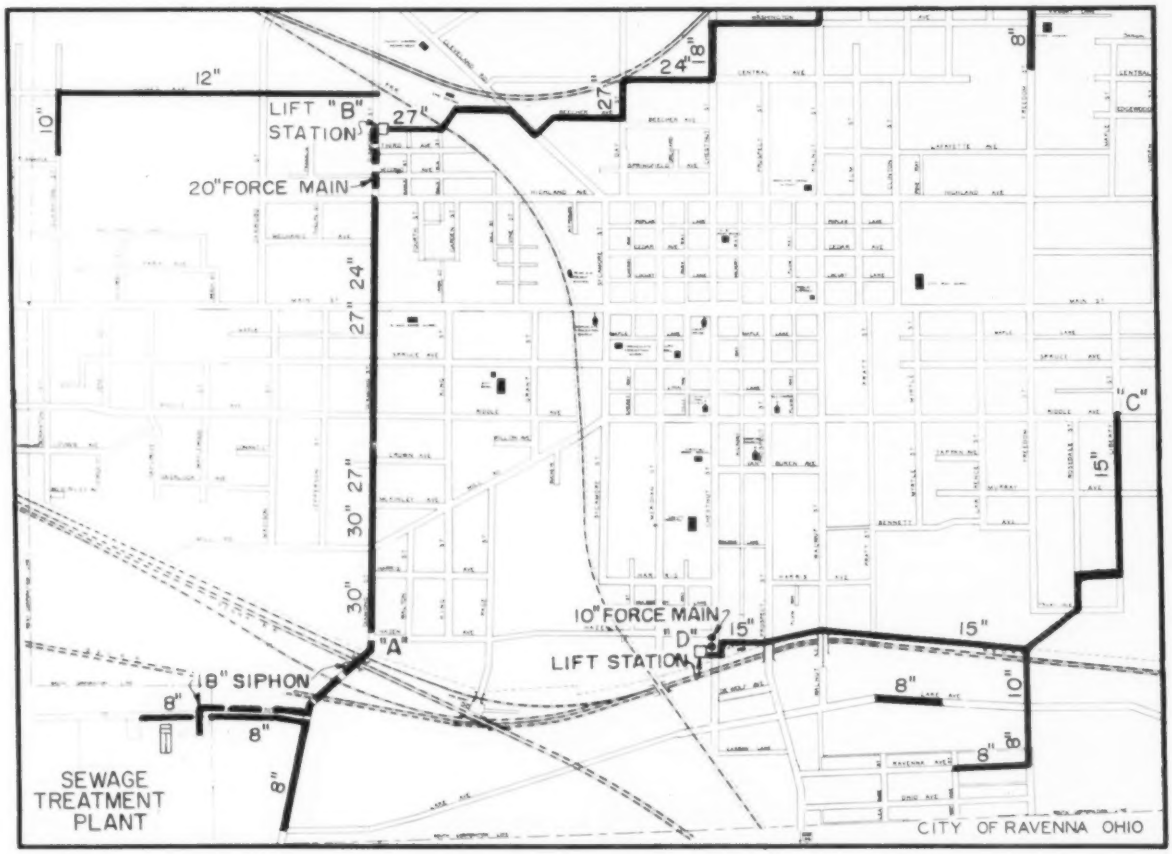
provement program was a primary plant only. It was well operated and produced a fine effluent for that type of plant. However, the need for secondary treatment had become urgent as the population increased and the ditch that carried the effluent became highly polluted during dry weather.

The improvements consisted of adding a comminutor and grit handling equipment; rebuilding the preaeration tank equipment; adding mechanically aerated activated sludge tanks and settling tanks; cleaning the digesters and repairing and reroofing their covers; and rebuilding and enlarging the open sludge beds.

The plant is designed to handle the sewage of 1980 from an estimated population of 13,500 persons plus the ordinary industrial loads that can be anticipated. The average daily flow in 1980 is estimated to be 1.5 mgd and the maximum flow that can be handled is 4.0 mgd.

Analyses of the sewage indicate a BOD loading of 2595 lbs. per day can be expected — a population equivalent of 15,250. The suspended solids are expected to amount to 3125 lbs. per day — a population equivalent of 15,625. The plant should be able to produce reductions in the 90 to 95 percent brackets.

The industries of the city are quite diversified in character and in general their wastes are not objectionable. There is one notable exception—a metal working plant occasionally dumps chromium wastes into the sewer in considerable quantity, causing disruption of the normal treatment processes. The management of the industry is cooperating with the city, and it is hoped that there will be no repetitions.



● **POINT "A" is collection point for most of Ravenna's sewage. Siphon, force mains and principal sewers are shown on map.**

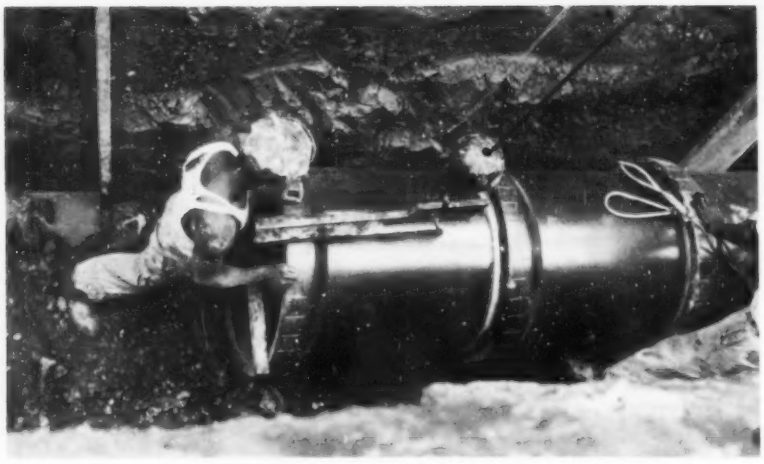
Financing

Ravenna has a sewer rental charge based, in general, on water consumption. Funds derived therefrom are used to pay for the operation and maintenance of the treatment plant built in 1942, for interest on the indebtedness, and to retire the bonds which made possible the building of the plant and interceptor sewers and lift stations. The recent additions and improvements to the plant were paid for from funds derived from the sale of special assessment bonds which will be retired from general property tax levies.

The principal sewers constructed in this program benefited the city generally and were paid for by issuance of revenue bonds; many of these sewers replaced smaller ones which had already been assessed against the abutting property.

Several sections of sewer added to the recent program for economy reasons, which serve unsewered areas, are being charged by assessment to the property benefited.

The first contract in the improvement program was for work at the treatment plant; construction started in November, 1955, and was carried along in a normal way to its completion and start of operation a year later. When the old digester floating covers were removed they were found to be badly pitted on the underside; the skirts also were pitted. Repairs were made by welding new plates over the damaged areas. The old heating coils were



● **TYLOX joints were used on the 30-inch vitrified clay sewer shown here. Sewer system design was complicated by fact that city lies in several drainage basins.**

in good condition and, after minor repairs were made, were connected to the new heating units. It is planned to use recirculation for heating the sludge, but the coils are available should they ever be needed. The new aeration and final settling tanks were in a hard ground excavation which contained water bearing sand strata which gave some trouble.

The major items of new equipment installed are the following: the comminutor was furnished by Worthington; grit elevator, aerators, sludge collectors and sludge pumps by American Well Works; the flow measuring nozzle by Builders-Providence; and the heat exchangers by Walker Process. The Welsbach Corporation of Philadelphia, Pa. was the contractor.

Sewer Construction

The sewer work was divided into three contracts, two of which were with the Tyson Construction Corporation of McLean, Va.; the other was with R. H. McManus & Company of Detroit, Mich.

Construction of the sewers, lift stations and the siphon was started in June, 1956, and was completed in November, 1957. All gravity sewers were built of vitrified sewer pipe using Tylox Joints. The pipe was furnished by the Universal Sewer Pipe Co.; the joints were manufactured by the Hamilton Kent Mfg. Co. All force mains are of mechanical joint cast iron pipe; the siphon is of asbestos cement pipe.

Ground conditions vary greatly throughout the city; in the main, however, no particular difficulty was experienced in any of the work. Some of it did however require close sheeting and the continuous pumping of ground water. Some parts of the work were done in tunnel where the cut averaged 25 feet. The tunnel was lined with timber and, after the pipe was in place, was completely filled with concrete or grout. Several main line and spur railroad tracks had to be crossed. Different methods were used in these places as conditions dictated. Some crossings were made by jacking steel or corrugated metal pipes under the tracks; in others the tunnel method was resorted to. In all crossings a metal pipe was installed before the sewer proper was put in place; all annular spaces were thoroughly filled.

In an effort to keep infiltration down to a minimum all vitrified sewer pipe joints were of the Tylox rubber-in-compression type. Many of the sewers built in this program were relay jobs and the trench bottoms were wet because all the existing house connections had to be cut and then reconnected to the new construction. Under such conditions many types of joints would have been of doubtful value, but the joint used gave excellent results. Infiltration tests, made wherever circumstances made them possible, showed results well under the specified maximum of 500 gal. per inch of diameter per mile per 24 hours.

Lineal feet of VC sewers installed included the following: 8-in., 6013 ft.; 10-in., 1107 ft.; 12-in., 2685 ft.; 15-in., 7117 ft.; 18-in., 1912 ft.; 24-in., 1813 ft.; 27-in., 4045 ft.; and 30-in., 1079 ft. Total lineal feet of VC sewers installed was 25,771 ft. and 2267 ft. of 18-in. asbestos cement pipe siphon were placed.

The two new lift stations are rectangular structures of the wet well—dry well type. The wet wells of both are open to the atmosphere for ventilation purposes and wet wells and dry wells are provided with blowers. The wet wells are large enough to store considerable sewage in case of short power outages. Overflows are provided to handle the sewage should the power be off for any great length of time. The pumps in both stations are Fairbanks-Morse. Provision is made for automatic operation. The design of both stations is such that the pumping equipment can easily be changed to handle increased capacities when the need arises. Additional units can be added or the present units can be made of larger discharge capacities by changing speeds, impellers and motors as may be required.

The total project cost of the improvements to the treatment plant, the new sewers and lift stations (including construction, engineering, legal fees, financing, purchase or lease of right-of-way, interest during construction, etc.) amounted to slightly less than $1,480,000.

During the study, planning and construction of these improvements there were several changes in the city's official personnel. At the completion of the work the principal officers were David E. Greene, Mayor; Harvey W. Yonts, Director of Public Service; Herbert Hansen, Superintendent of Sewers and Treatment Plant; and Karl Dussel, City Engineer. Geo. G. McClelland, City Solicitor, and his assistants did considerable legal work in connection with the purchase or lease of right-of-way and in the many negotiations with the railroad companies.

Floyd G. Browne and Associates made all the studies and designs and supervised the construction. H. R. Krebs was their Resident Engineer; he was assisted principally by H. F. Zeitlow, all under the supervision of the writer.

• • •

Water Pipe in Service 149 Years

The 1958-1963 program for Philadelphia, Pa., provides for improvements to the water distribution system which "has been growing by additions for more than 150 years. All of the wooden pipe has been replaced, but cast iron pipe laid in 1819 is still in service. Although most of the 4-in. pipe has been replaced with pipe of larger diameter, there are many miles of 6-in. pipe in congested areas" which is not adequate for fire protection or domestic supply.

WINNING PUBLIC ACCEPTANCE OF WATER METERING

CLIFFORD RUSCH
Administrative Assistant
Office of the City Manager
Fredericksburg, Virginia

WATER METERING is frequently used to reduce water waste and to increase the number of years a city can meet its water needs without expanding its treatment facilities. When Fredericksburg, Virginia, was faced with increasing water consumption, a limited water supply which could become critically short during the summer months, and a filter plant which was rapidly approaching its treatment capacity, the City Council authorized the initiation of a water metering program. Although metering has achieved a significant reduction in water consumption and delayed the need to expand present treatment facilities an estimated ten years, the changeover from a flat rate charge based upon fixtures to a charge based upon water consumption was greeted with something less than universal joy.

As would be expected, the unhappy citizens were those whose water bills increased because of metering, and most of the dissatisfaction was attributable to several major causes. First, there was resentment because of the lack of warning. Customers who had undetected water leaks were unpleasantly surprised when their first metered bill reached them. Secondly, some people were dissatisfied because they did not understand the operation of the new billing procedure and metering system. Thirdly, many citizens who received large water bills failed to realize the large amount of water wastage which results from even a small leak.

Initially the city administration dealt with this dissatisfaction by waiting for complaints. When an irate citizen stormed into City Hall, water department employees attempted to placate him by explaining the billing and metering operation, the amount of water a leak could waste, and, in cases where he remained convinced that the meter was wrong and denied the existence of water leaks, a recording device which recorded the time and amount of water consumed over a 24-hour period was installed on the meter.

However, as any public official knows, an irate citizen is not especially susceptible to rational explanations. Therefore, F. F. Funk, Fredericksburg's City Manager, initiated several means of explaining the metering program to the citizens.

First, citizens with abnormal consumption are warned before they are billed on a metered basis. Meters are installed prior to the date for the regular quarterly reading. Until the quarterly reading, citizens continue on the flat rate basis. After the first reading they are billed according to the amount of water consumed. However, if an abnormally large amount of water is used between the date the meter was set and the first reading, the citizen is notified by letter of this fact and is advised to check for leaks. This procedure allows the property owner to correct the condition before a leak has a significant effect on his water bill.

After receiving this letter, the property owner frequently comes to City Hall with questions on billing and metering procedures and for suggestions on where to check for water leaks. In some cases, the recorder is installed to indicate if leaks do exist. The water department had been answering the same questions on a complaint basis,

● **CLEVER public relations item—a card indicating amounts of water waste with a free faucet washer attached.**

This faucet washer is FREE

Use it to STOP A LEAK and save money.

Ask us to show you how.

Do you know that a hole in a water pipe . . .

this size	wastes
.	170 gallons
•	970 gallons
●	3,600 gallons

each day?

---Your Water Department
City of Fredericksburg

● **WATER exhibit at Home Show. Card with attached washer is handed to visitor. In background are recorder and charts illustrating water consumption patterns.**

but there is a marked difference in citizens' attitudes when they are made aware of high water consumption, whether as a result of water leaks or not, before they receive their first bill based on metered consumption.

Another step was to initiate a series of cartoon advertisements in the local newspaper stressing the saving of water by eliminating leaks. The cartoons were furnished by the American Water Works Association and the captions were prepared by the City Manager.

Finally, the city took advantage of the local Home Show to present a display spotlighting the water metering program and emphasizing home water conservation. The water department set up a booth with an actual meter installation including a portion of a water main, a meter barrel, water meter, and service line, and a spigot with running water. Electrically driven meters with a portion of the casing cut away to show the working parts were obtained from the Hersey Mfg. Co. A recorder and several charts portraying different patterns of water consumption were displayed, and to show the low cost of water, 15 one-gallon jugs were filled with water and displayed under a sign advertising "The Best Buy In Town—15 gallons for 1¢." Printed cards which indicated the amount of water wasted by different size leaks in water pipes were distributed to anyone who visited the booth. A washer was glued to the card, and each visitor was asked to request a demonstration of how to replace a faucet washer.

It is probable that these procedures have resulted in a significant reduction in the number of complaints stemming from the water metering program, but more significant is the fact that they have reduced the number of people who come to City Hall "hopping mad." In short, it made it easier to deal with and help the majority of the persons with problems stemming from the water metering program, and this has created a better feeling for the water department among the public.

REFUSE COLLECTION and DISPOSAL IN ALBUQUERQUE

From the annual report of

G. R. Robertson, Superintendent

Sanitation Department

Albuquerque, New Mexico

Photos Courtesy

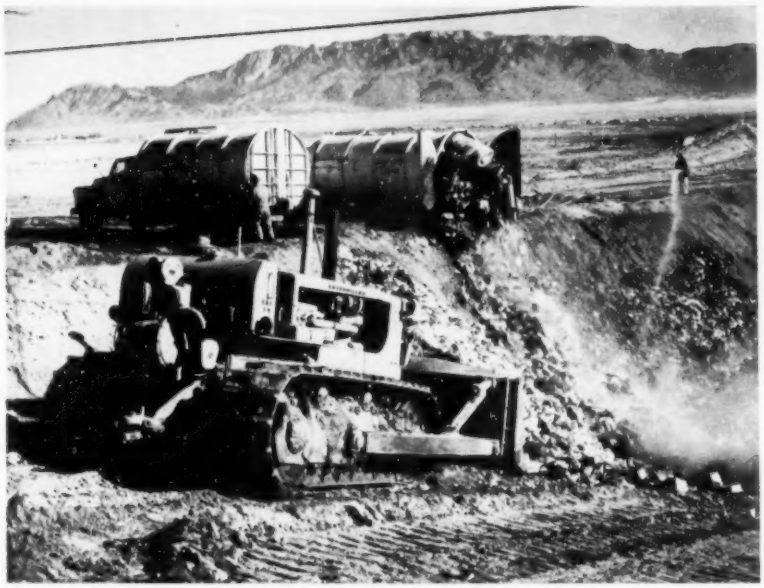
Caterpillar Tractor Company

THE SANITATION Department of Albuquerque provides coverage of 54 square miles. There are 39 collection routes divided into four districts each supervised by a District Foreman. Of these 39 routes, 12 are classified as Commercial Dry Garbage Routes, 3 are classified as Commercial Wet Garbage Routes and 24 as Residential Garbage Routes. The 24 Residential Routes are divided into 13 consolidated routes and 11 "standard" routes. The consolidated routes are handled by 2 trucks manned by a crew of one Route Foreman, a driver and from 4 to 6 helpers, all working together. They start their routes in the morning with two empty trucks. As soon as one truck is loaded it is taken to the disposal area by the driver and unloaded. The remaining crew members then start loading the other truck. The Route Foreman remains on the Route most of the time to supervise the crew.

By using this system in the last two years we have saved considerable time on the routes. We have also been able to shift the third truck to other duties, thereby increasing the efficiency of the Department which otherwise would have been seriously hampered by the tremendous growth of the City. In some areas where the homes are widely scattered the consolidated system will not work effectively, therefore, it is necessary to use the standard system. The standard system uses a crew of three men—one driver and two helpers. When the truck is loaded all three men ride to the disposal area to unload.

The Sanitation Department operated with a total force, field and office, averaging about 217. It has maintained a twice-a-week collection schedule throughout the City. Collections include both wet and dry garbage, which in Albuquerque are not separated except in a few cases. Disposal is by sanitary fill. Albuquerque wants to keep its garbage cans out of sight, in the rear, but there are few alleys, so most of the collections involve a great deal of walking for the crews. To hold down the costs of collection and still permit cans to stay in the rear the Department has made maximum use of the "consolidated route" idea. There appears to be only one remaining means of increasing efficiency, and that is to acquire an additional site for filling so that the over-all average length of trip to the disposal area can be reduced.

During 1956 we collected and hauled to our sanitary land-fill area a total of 28,495 loads of refuse (26,437 loads averaging 2.40 tons per load; 1,223 loads averaging 3 tons per load; and 835 loads averaging 2.50 tons per load for a total of 69,205 tons). In March, 1956, the Bureau of Reclamation closed the disposal area along the river which has long been used by the City and various contractors to dispose of street sweepings, broken concrete, building material, tree limbs, etc.; therefore, it was necessary for other City Departments and private haulers to start using the sanitary land-fill, thus creating more work for the



● **DUMPING refuse into trench at sanitary landfill. Note hosing to reduce fire hazard and aid compaction. D9 tractor is spreading refuse prior to compacting it.**

Sanitation Department. A charge was made for other City Departments for this work at the rate of 50¢ per cubic yard and $3,495.87 was collected. Firms and private individuals pay a minimum charge of 50¢ and 50¢ a cubic yard thereafter; $8,016.00 was realized from this source. A total of $11,511.87 was collected in dumping fees for the year. By good planning of the sanitary fill operations several acres of land adjacent to the Municipal Airport have been built up to a grade that is now suitable for beautification or for commercial purposes or automobile parking.

Two sanitary landfill sites are operated for the city and a third site is now under consideration. Terrain conditions are ideal for sanitary landfill operations. The rolling hills and arroyos are mostly sand and gravel. Garbage dumped on the site near the Airport is handled by a Caterpillar D9 Tractor. This big machine recently replaced a D8 because of its greater speed and production. The cut and fill method is used, with about 12 inches of dirt spread over 18 ins. of compacted refuse. Near grade, a top cover of 4 feet of soil is dozed over the fill. A D8 is used on the second site. Compaction is increased and fire hazard is eliminated by keeping the refuse wet with a fire hose.

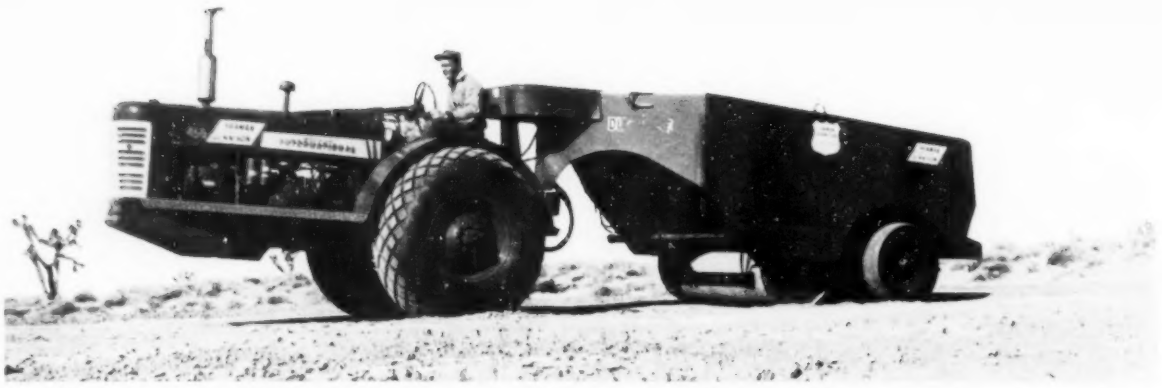
During the late spring and summer the Department concentrated on the fly situation. The downtown commercial section was sprayed once every 15 days; the remainder of the City was covered twice during the summer. Refuse trucks were sprayed twice a week. The State Fair Grounds and stables were sprayed and during the 250th Anniversary Celebration the areas where horses were stabled were sprayed every other day to keep the flies down. About the middle of May, the Department was called upon to control an infestation of grasshoppers in the northeast area of the City. By using a residual spray of Dieldrin we were able to bring the invasion under control.

In April the City's first full scale clean-up campaign in several years got under way. This work took approximately eight weeks to complete. Every section of town was cleaned, including all alleys and easements. Where there were no alleys the residents put the trash at the curb for the trucks to pick up. This work was handled by two trucks, manned by two truck drivers and 10 helpers. A total of 5,758 cubic yards of trash and refuse were carried to the disposal area during the campaign which created much favorable comment by the taxpayers.

The safety Program of the Sanitation Department includes: 1). Weekly safety talks for all employees; 2) accident investigations of all injuries by the Safety Director; 3) safety literature and posters; 4) safety films; and 5) on-the-job safety evaluations conducted by the Safety Director. The Safety Program has shown progress in the few months it has been in operation. A Safety Program properly administered will improve the operation of the department and save the taxpayers many dollars.

In July an "extra-board" to provide emergency workers for garbage collection crews was set up. This board provides men who are on call each day to keep crews at full strength, thereby maintaining the day-to-day efficiency of operations.

● **WETTED refuse has been compacted—an essential step in sanitary landfill operation. Covering is next step. The two Albuquerque fills handle 250 tons daily.**



● **WATER is used for ballast in this compactor. Valve turn varies rolling weight or converts the Duo-Pactor into a sprinkler.**

Better Compaction on County Road Work

A GROWING realization of the importance of adequate compaction in county highway construction, reconstruction and maintenance, coupled with the development of versatile mobile equipment, providing for both pneumatic compaction and steel rolling in one self-propelled unit, has resulted in reducing compaction costs in several Iowa counties. One of the first to purchase the equipment, the Seaman-Gunnison Duo-Pactor, was Blackhawk County, Iowa, Clarence Baldwin, County Engineer. This Duo-Pactor provides both a steel roll and bank of 8 rubber compactor tires in one machine; and is self-powered, permitting travel from one location to another at speeds up to 17 mph.

About 850 miles of roads in Blackhawk County are under Mr. Baldwin's supervision. Of this, 75 miles have been bituminous surfaced; about 40 miles were seal-coated during the past season; also some salt stabilization base work was done. Both the bituminous program and the base stabilization work, using a crushed stone base, are to be expanded.

Compactor Operation

On new base and seal coat work, the crushed stone is spread and then rolled to a 5-inch compacted thickness. This rolling is done mainly with the rubber rolls of the Duo-Pactor in order to obtain the kneading action characteristic of pneumatic compaction. The steel roll is lowered for the final pass to insure a smooth, level surface. After this final rolling, the surface is shot with ¼ gallon per sq. yd. of cut-back and chips are applied and rolled in. The steel roll is used in the first pass to press the chips uniformly into the bitumen across the entire width. After this rolling, the surface is allowed to cure; a second coat of oil and chips is then applied.

On this machine, the operator, by means of hydraulic controls from the seat, can retract the steel roll and apply pneumatic compression for the surface rolling. Similarly, he can lower the steel roll and raise the rubber roll assembly; or both can be applied at the same time, with the weight divided in any desired proportion between rubber and steel.

On the Blackhawk County salt stabilization work, up to 1000 tons of crushed stone and 6 to 8 tons of salt per mile are used. Stone and salt are blade-mixed and shaped, then rolled. The major compaction is with the rubber rolls with the steel roll lowered for the final pass. This smooths out ridged material and assures a smooth and even surface for the completed job.

● **STEEL roll tends to spread aggregate for base to a uniform thickness for further compaction by rubber rolls in rear.**

● **RUBBER rolls give uniform compaction density and knead aggregate; steel roll irons out ridges left by rubber rolls.**

DRIVEWAYS and APPROACHES for MODERN AUTOMOBILES

MARVIN ANAYA,
Deputy City Engineer,
Pittsburg, California
formerly Director of Public Works and City Engineer,
El Cerrito, Calif.

A PROBLEM in private driveways and approaches has resulted from lowering the wheels and chassis, lengthening the wheel bases, and extending the front and rear overhangs of automobiles. It is important to realize that this problem will become increasingly serious as time goes on, for whatever designs the future may bring, the years immediately ahead will see increasing numbers of current designs on our streets and highways.

We can control the design and construction of new driveways and approaches by means of up-to-date regulations, and proper office and field procedures. But we will be faced with many reconstruction problems. And in both cases there appears to be a need for a variety of solutions, as too much standardization may not prove practical.

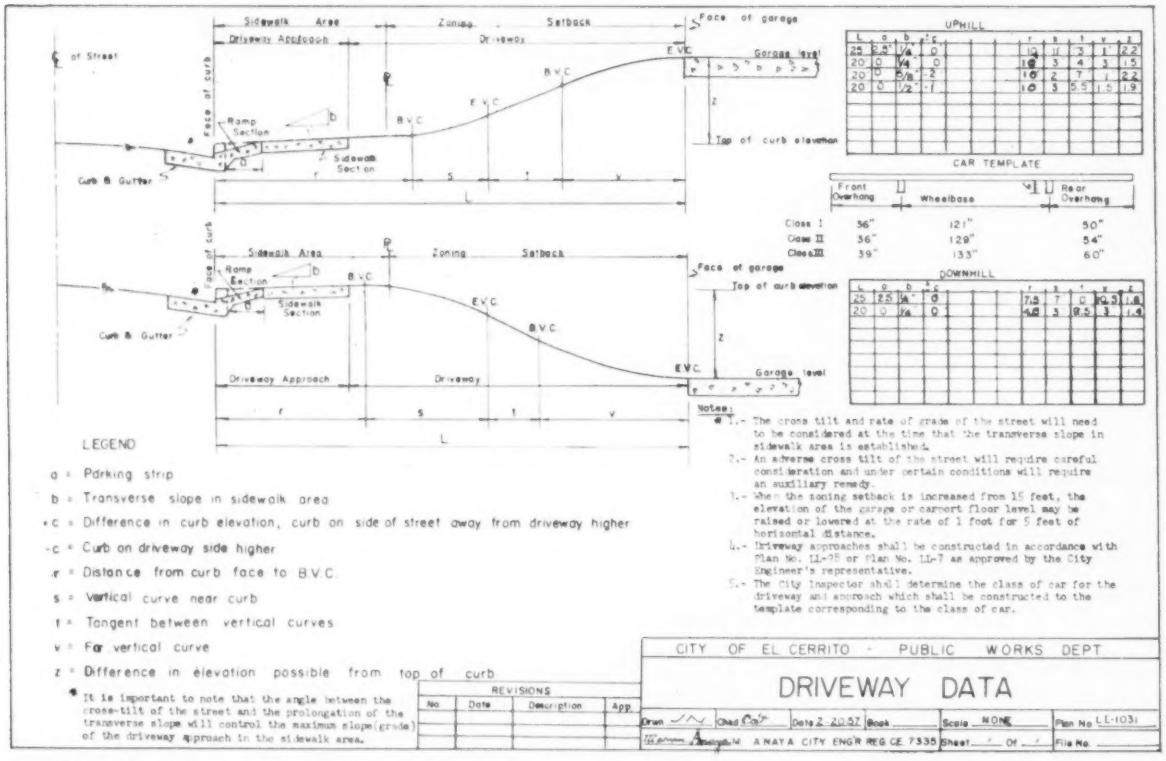
The problems of the driveway approach, and the driveway on private property, may be divided into two categories: (1) the construction of new driveways and approaches; and (2) the correction of existing driveways and approaches.

No public works department should be responsible for the design or construction of new driveway approaches without having on file and furnishing to the public standard drawings showing how these facilities should be constructed. Everyone who takes out a building permit or a permit to construct a sidewalk or driveway approach should be given a copy. These standards should set forth the requirements for adequate physical construction.

This brings up the matter of grades. As a result of plotting many profiles for driveway reconstruction for modern cars, including '56 and '57 models, the El Cerrito Engineering Div. found that it is now seldom feasible, and often impossible, to drive from the paved roadway in a hill area, across the driveway approach, if the grade of the approach exceeds about 5 percent. The approach grade is best kept at less than 5 percent.

As a result of a physical survey and study we grouped 1956 passenger cars into three general classifications, and one special classification to form a composite of the respective dimensions.

From the dimensions of the cars—the ground clearance, rear overhang, front overhang, wheelbase, overall length and height, car templates are prepared. The procedure is to draw the outline for each class to a scale of 1-inch to 2 feet on heavy cardboard, fiberboard or acetate and then cut it out for use on a prepared profile of the driveway. This method allows for the construction of three standard driveway profiles,



● **DRIVEWAY data sheet furnished as a guide to driveway design. Specific dimensions will depend on class of automobile.**

and one special profile. Zoning regulations for the district, the topography of the lot, and the maximum slopes allowed for driveways and approaches are the usual bases for determining what class of template should be used in the construction of the driveway approach for a specific location, although valuation of property may also need to be considered.

The driveway profiles which need to be provided for each class of cars, are based upon: (1) Maximum tangent slope of 20 percent; (2) unsymmetrical vertical curves between tangents; (3) property line 10 ft. from face of curb; (4) building setback line 15 ft. from property line and 25 ft. from face of curb; (5) tilt of the street-cross slope 2½ percent; and (6) elevation of the floor slab above or below top of curb which can be increased at rate of 1 ft. for each 5 ft. of additional horizontal setback distance. These profiles were developed from motion studies showing relationships governing design.

Controlling New Construction

Technical data necessary to insure the construction of adequate driveways and approaches have been assembled on one sheet which is furnished to the permittee and others.

The applicant for a building permit should be required to furnish a survey map of the lot on which it is proposed to construct a garage or carport. The survey map should include not only the boundary lines of the lot but also the contours at not greater than 5-ft. intervals. Elevations referred to a bench mark should be shown for the top of existing curbing; along gutter and center line of street; and on 5-ft. contour intervals; and the elevation of the garage floor or carport slab should also be marked. The applicant should be required to furnish a profile drawn along the centerline of the proposed driveway approach and driveway to the garage or carport, or along both sides of the driveway when it appears to the plan checker that the maximum authorized slope will be exceeded.

In general, as recommended by FHA, it is best not to exceed ⅝-in. per ft., which corresponds to approximately a 5 percent slope in sidewalk area of the driveway approach. The slope might be increased to ¾-in. per ft. or approximately 6 percent, although this is not desirable for a sidewalk slope.

At the time an applicant is issued a building permit, he should be required to execute an agreement when the plan checker has determined that the driveway slope is to be in excess of 14 percent. The purpose of this requirement is to prevent irresponsible persons from constructing improper approaches and driveways at the expense of the future property owner. The same agreement should be required of the applicant who requests a permit to construct or reconstruct approaches to driveways where the existing slope is in excess of 14 percent.

Designs for Alterations

Many engineers are now facing the problem of approving plans for the alteration of existing driveways to accommodate the new cars. The usual problem is in the approach, and the simplest corrective measure is usually the installation of a pad or bridge at the gutter. We have developed construction details for six types of approach alterations the principal features of which are as follows:

Type I consists of a concrete slab, or plant-mix surfacing in the gutter to elevate the rear of the car as it passes from the street to the garage or carport, or vice versa. This type of correction may be used at gutter summits, on slopes of streets with grades above 1 percent. Principal disadvantages are interference when resurfacing the street, some interference to the motorist, a tendency to force the gutter water into the traffic lane, the creation of standing pools of water if the street grade is less than 1 percent, and more serious interference with gutter drainage in the sag of a vertical curve. This type has advantages of low cost and safety to the motorist and pedestrian.

Type II is similar to Type I, except that the gutter pad should be of concrete and a slot provided between the face of the curb and back of the pad to provide free gutter drainage. This slot creates a potential hazard to the pedestrian and potential liability to the city or county.

Type III is similar to Type II, but has a nonslip anchored cover plate over the slot. This provides greater safety to the pedestrian, but is still a potential hazard.

Type IV, similar to Type I, is provided with a pipe; but it is not possible to install a pipe which will not plug up easily from debris.

Type V provides a drain diversion under the parking strip or sidewalk. It is desirable where a culvert of 8-in. diameter or a flattened steel pipe can be so installed together with an adequate reinforced slab in the driveway approach, and where a large quantity of water may flow in the gutter on a street with a steep grade.

Type VI is the familiar bridge used on many driveways in hill areas in the past; it is dangerous to the motorist, and creates many problems during street resurfacing and in drainage.

These data are condensed from a paper by Mr. Anaya at the Institute of Transportation and Traffic Engineering of the University of California.

Non-Burnables Buried in Sanitary Fill

● **THREE sanitary landfills are operated by the City of Dayton, Ohio, to dispose of non-burnable materials such as glass, cans and ashes. An International Drott TD-14 4-in-1 and an International TD-14 with blade are used for the landfill operation.**

● PICK-UP nozzle can be detached quickly and an 8-inch auxiliary line used in its place.

● HARD-TO-REACH places are cleaned with the 8-inch auxiliary suction hose which has a long aluminum nozzle to reach confined areas easily.

VACUUM STREET CLEANER
Does Speedy Job

VESTA VICTORIA

THE LOS Angeles Bureau of Street maintenance has put into operation a mammoth vacuum street cleaner which sucks up bottles, cans, wet and dry litter at the velocity of 100 mph. The truck requires only one driver and one workman, as compared to the usual gang-cleaning crew, which ranges from 4 to 6 laborers, plus the driver.

The $11,000 cleaning machine is powered by a Waukesha, heavy-duty 4-cylinder engine and is truck mounted on an F22 Reo body. The engine drives the high velocity fan which pulls light debris directly through the pick-up hose into the 16-yd. capacity body, with no chance of solids breaking or jamming the fan blades.

As the vehicle moves down the street, litter, leaves and other debris are pulled through the main 12-in. pickup nozzle over a 2½-ft. wide path. It cleans parkways and unpaved roads, sucks out drainage litter and gets quickly at places almost inaccessible to the former gang-cleaning crew.

Small work in confined areas is done by the 8-in. diameter auxiliary suction hose, whose 60-in. aluminum nozzle reaches easily to confined areas, between and under parked cars and in alleyways and parkways.

On a heavy run the machine may clean as few as 4 or 5 curb miles, but it will clean up to 10 or 15 miles normally. It can haul as many as 5 loads per day, depending on the location of the disposal site. It has an extra low gear for traveling at speeds of less than 5 mph, although it can travel and clean efficiently at 8 to 10 mph in some areas.

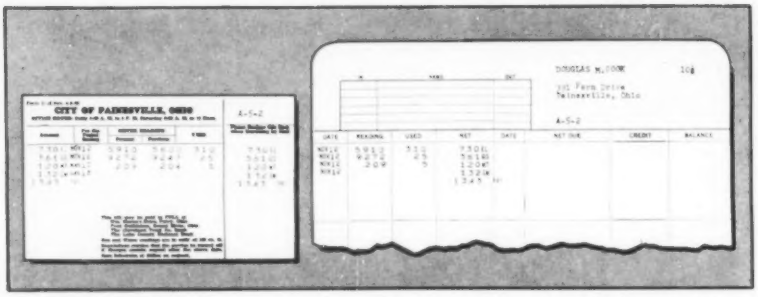
Once at the disposal site, its hydraulic 7-ton hoist automatically dumps its load. The rear portion of the tapering body is wider, thus eliminating the problem of starting jammed loads.

Maintenance engineers have modified the original equipment (Obeco's "Tornado" street cleaner, made by the Omaha Body and Equipment Co.), in some ways. They have changed the truck cab to inside right hand drive so the driver can see and maneuver more easily. They also shortened the prime intake hose from its standard approximate 10-ft. length to 4 ft. to cut hose changeover time to half a minute. Special, easily removed filters in the airtight body prevent carry-over of debris. Objectionable quantities of dust caused by loading are drawn inside the body and kept there.

Safety features for the workmen on the machine are many. There are no hazards such as moving parts, open chains or sprockets. The workmen can't fall off open-top trucks and there are no gears or exposed machinery which can injure an operator.

Los Angeles' street maintenance budget for 1954 was $10,327,340. Today the budget is $13,830,000. The number of employees in the street maintenance department is 2,107.

Ben R. Paris, Director of Public Works, says, "Thus far our experience has been very good with the new machine. But we want to establish more of an experience factor, both from the mechanical maintenance and operating standpoint, before expanding our use of this type of equipment."



● **POSTAL CARD bill, shown at left, and ledger card are the only forms necessary in the accounting and billing systems for gas, water, electric and sewerage charges.**

MECHANIZED UTILITY ACCOUNTING BRINGS SIMPLIFIED, ACCURATE RESULTS

E. BURDETT TALCOTT,
Treasurer
City of Painesville, Ohio

PUBLIC utility accounting and consumer billing are probably two of the most important and strategic functions carried on in any municipality. Effective bookkeeping in the vital public utility areas demands first of all absolute, pin-point accounting control. If concrete, fact-figure accuracy is not continuously maintained, a few unaccounted for dollars can virtually "snowball" into one big, costly and time consuming balancing problem.

By being consistently on the alert for new bookkeeping methods and modern equipment, we have gradually developed a simplified, proof-positive "check and cross-check" records-keeping system. Actually, we have changed what once was a tremendously complex situation into a simple and systematic, almost cut and dried operation.

Our progressive procedure operates around two Burroughs Sensimatic municipal accounting machines and a Burroughs billing machine. With these automated bookkeeping machines we have eliminated the once costly headaches of multiple-utility accounting and billing.

Also, we have managed to consolidate our four utility service charges on one ledger card and one monthly postal card bill. In so doing we have considerably cut operational costs, greatly improved the accuracy of our billing procedure while eliminating the tedious, monotonous and tiresome job of hand posting. We now bill every utility service once per month, including water.

Handling these four necessary areas of municipal government is a costly job for any medium size community. And, besides the obvious physical costs of salaries, expensive technical plant equipment, and the various operational necessities, there is the accounting cost of computing, preparing and recording the thousands of bills sent monthly to consumers.

Bills per Month

Of necessity, this important and generally complex accounting operation must be simplified, efficient and economical. These factors have been incorporated into our system with very satisfactory results. We now process approximately 7,000 bills each month amounting to almost $150,000 and we are always up to date and in balance.

As our present method is set up it begins with the actual meter reading. A meter book contains a record of each utility, with pages for electric, gas and water. For ease of recognition these are different colors. The meter amounts are recorded from the bottom of the page toward the top. This simplifies later subtraction.

For additional simplification gas and water are read in even numbers or hundreds of cubic feet. Electricity is read in even numbered kilowatts. In this manner the actual readings are sometimes a little bit over or under the amount of the meter but eventually are brought up to date. The meter books are turned over to the accounting department where the individual consumption amounts are computed and recorded.

The charge for the consumption amount is read from a rate chart which lists a corresponding charge for the amount consumed. Extremely large or commercial amounts are manually computed. When both of the amounts have been noted for each utility and the book is completed, it is turned over to the billing machine operator.

A corresponding group of ledger cards for the meter book and a group of addressograph postal card bills are all that are needed in our billing operation. Our two-part consumer ledger card covers a full year of activity with six months on each side of the card. It is also divided into a debit section and a credit section. The consumers name is addressographed at the top of the card plus the code service number for the section of the city in which the building is located.

The billing machine operator then inserts the ledger card and postal card into the machine. These are simultaneously prepared, along with a journal which is later used as proof of overall accuracy. The operator first indexes the date of the reading which remains locked in the machine for all bills prepared on that date. She then indexes the new reading followed by the old reading. The machine automatically subtracts and prints the new consumption amount. The charge is then indexed and is also immediately printed along with the code for the utility being billed. The code symbols are EL for electric, GS for gas, WT for water, and SW for sewer, and are also automatically printed. They do not require a separate indexing.

For error-free operation the machine immediately locks if the operator has indexed an incorrect number. The operator can re-index the correct information at the point of error. The incorrect amount is completely thrown out and is not carried in the accumulating totals which we receive at the end of the run.

This billing process is repeated for each of the services used. The sewage fee for our community is a

percentage amount based on the amount of water used. For this information the operator again checks a rate chart for the exact amount and it is then recorded on the ledger card and bill. The machine then totals and prints the grand total of the utility charges for the account.

The important factor here, besides the speedy billing operation, is that individual utility totals for consumption and charge amounts are accumulated in the billing machine. At the end of a run these totals are printed on the journal along with their respective code categories. This journal is compared to and must agree with an adding machine prelisting for concrete proof that each consumption and charge amount for each utility are absolutely correct.

Arrears or Unpaid Bills

With our multiple total billing machine we have solved the once troublesome problem of keeping track of arrears or unpaid bills. For example, when an account is being billed and the old bill has not been paid there is a blank space on the right side of the ledger card where the bill should have been credited.

Here the operator merely indexes the new charges, and in addition she indexes the old amounts. These are code indicated on the ledger and bill with an "A" which indicates "arrears." These are also accumulated in the machine thereby giving us individual current totals plus individual arrears totals.

For a further cross check of accuracy we use the Sensimatic accounting machine to post separate consumption and charge amounts of each meter reading onto a second journal. The tax charge total is accomplished on our Duplex adding machine. These combined totals also must agree with the billing machine totals.

That completes our simplified billing procedure for this particular cycle. The next step is posting the payments. As payments are made the stub part of the postal card is cut off and the payment amount recorded. The stubs are then sorted into sequence according to the service numbers and sent to the Sensimatic operator.

She takes the corresponding ledger cards and begins crediting or posting each account. In this procedure she picks up the old balances, if any, from the ledger card. She then indexes the current individual amounts for each utility. These amounts are also taken from the ledger card. She then indexes the amount paid on each utility from the stub itself. If the ledger card and bill stub amounts have been indexed correctly and the total amount of the payment is paid up to date, the Sensimatic prints a cipher proof indicating that the account is paid in full. If the consumer pays an amount less than the balance due the Sensimatic will print the balance due on the ledger card. This amount will be added to the next month's bill.

If an account is in arrears or the bill is not paid, no information is recorded on the ledger card because there is no accompanying bill stub. Consequently the blank block will indicate that the bill has not been paid when the next meter reading is to be recorded on the ledger card.

In this operation the Sensimatic also accumulates individual totals for both current and arrears amounts. These are later used for another proof of correct cash postings. This operation insures that all payments have been properly recorded on the consumer's ledger card.

Under our old hand posting system, we used various ledger books and journals, a tough and cumbersome procedure. Besides the hours and sometimes days necessary to handle this operation we did not have any of the automatic checks or cross-checks which we presently maintain. The majority of these grand totals are actually by-products of posting and are not separate time consuming jobs.

For instance, the Sensimatic cash posting journal or record of all of the payments for each day is used later to provide information for our tabulation sheets. These are breakdown totals for each of the services for each day for each meter book. We have 41 meter books and with pen and ink methods it presented a difficult balancing job. Our present system is run on a continuous basis but is a great deal more efficient and accurate in comparison with the old operation.

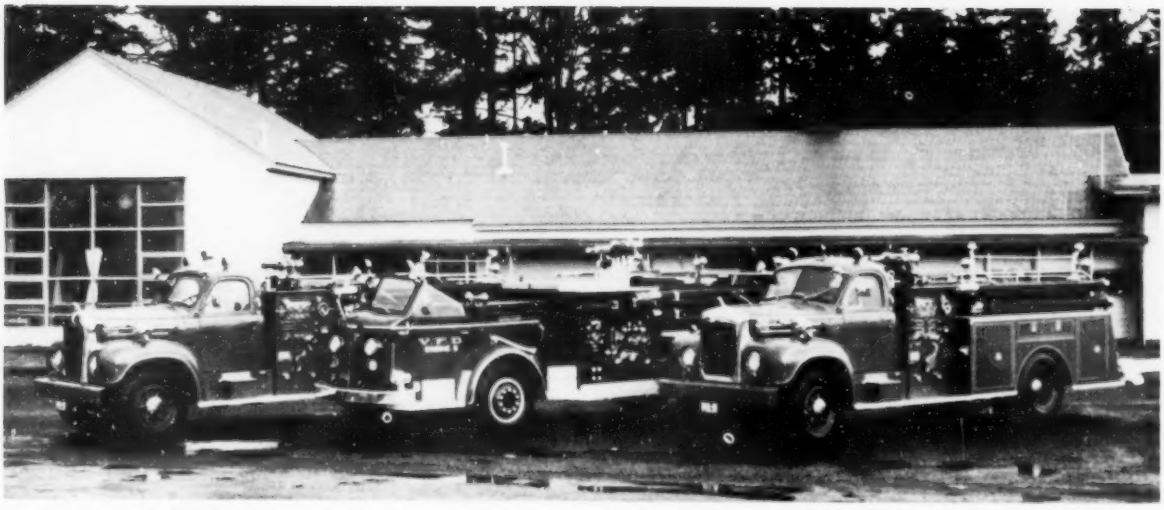
At the beginning of each month we take a total of arrears and at the end of the month add this amount to the total billing. We then deduct all payments made during the month and this balance is our new arrears total for that month. This total must equal the amount of all of the arrears totals provided on the daily billing journals.

This type of cross checking insures the type of control needed for effective public utility billing and accounting. Our system has more than fulfilled our expectations, but unquestionably the greatest factor in our entire automated system is speed and accuracy. These two features have enabled us to always be in balance and to be always accurately balanced.

This article appeared in a recent issue of *Ohio Cities And Villages* and has been slightly condensed here.

● **LEDGER** card and postal card bill are prepared simultaneously. Machine performs many labor savings functions.

● **PROOF** journal is prepared on a second accounting machine to provide a further accuracy check on the billing.



● THREE new 1,000-GMP pumpers aided in reducing insurance costs, but water department improvements were essential also.

FIRE RATING CHANGE SAVES CITY $90,000 PER YEAR

B. G. SMITH
Director of Public Works
Vancouver, Washington

THROUGH a survey made in July, 1957, by the National Board of Fire Underwriters, the City of Vancouver has been raised from Class 4 to Class 3 in rating. This will result in an approximate saving of $90,000 per year to the property owners of the city. In order for a city to qualify for a Class 3 fire rating, it is necessary for it to have less than 1,500 deficiency points as rated by the Fire Underwriters. Grading is done under the following categories: 1. Water supply; 2. fire department; 3. fire alarm; 4. police; 5. building laws; 6. fire prevention; 7. structural conditions; and 8. climatic conditions.

In 1955 Vancouver had 1535 deficiency points. To reduce the number of these, we started on a comprehensive program of improvements.

Vancouver's Six-Year Plan included improvements in the Fire Department and a capital improvement program for the Water Department. These measures brought a substantial cut in deficiency points so that the survey of 1957 reduced Vancouver's deficiency point total to 1406.

Beginning in 1952 the Water Department initiated a program of improving its facilities to provide the services needed by our ever-demanding public. This consisted of expanding and refurbishing our distribution system, adding new hydrants, drilling new wells, constructing a new reservoir and numerous other improvements.

In 1952 two wells were drilled; one at Pump Station No. 4 and one at Pump Station No. 3, with pumping capacities of 1,000 gpm and 2,000 gpm respectively. The new mains installed amounted to 36,909 ft., of which 16,168 were 6-in., 10,096 ft. were 8-in. and 9,027 ft. were 12-in.

The renovation and roofing of one half of the then unused McLoughlin Heights Reservoir was a 1953 project which cost $75,395. This added four million gallons of storage. An automatic pump control system was installed which greatly increased the efficiency of our pump stations. The amount of pipe added in 1953 totalled 44,170 ft. of 4 to 20-in., with 6-in. amounting to 25,859 ft.

In 1954 the department installed a two-way radio system for better communications with the field crews. In addition 43,040 ft. of pipe were installed. Of this, 33,490 ft. were 6-in., 4,838 ft. were 4-in., 3,258 ft. were 8-in. and 1,197 ft. were 10-in.

The year 1955 saw the Water Department repair and roof the other half of the McLoughlin Heights Reservoir at a cost of $62,150. This brought the total capacity of this storage unit to eight million gallons. A 750,000-gallon elevated storage tank was constructed adjacent to the McLoughlin Heights Reservoir at a cost of $117,486. The construction of this tank enabled the city to abandon and demolish the old wood tower tanks in this area. Installation of pipe amounted to 71,875 ft., including 48,000 ft. of 6-in., 8,589 ft. of 8-in., 3,705 ft. of 10-in. and 6,807 ft. of 12-in.

During 1956 the improvements included construction of 51,416 ft. of pipe. In 1957, the program of construction consisted of a new 1,250,000-gallon reservoir at Pump Station No. 3 at a cost of $85,000. A booster station was constructed adjacent to the McLoughlin Heights elevated tank costing $9,800. The department also improved the automatic pump control system so that it would indicate pumps in operation, operation time for each pump and total gallons delivered from each pump. The total amount of pipe installed amounted to 50,648 ft.

Over this five-year period the Water Department installed 149 fire hydrants throughout the city. The total number of metered services increased each year during this period while flat rate services declined.

The Fire Department gained considerably through the Six-Year-Plan, mainly through the addition of three 1000-gpm pumpers; construction of Station #5 in the Fruit Valley district; adding two fire inspectors (under Civil Service) to the Department; and constructing a fireproof fuel storage and pump building to fuel all apparatus.

In addition a more efficient program of maintaining the present alarm system, new building and electrical codes, addition of an electrical inspector and additional personnel on the Police Department have contributed in reducing the deficiency points.

PLANTINGS FOR HIGHWAY ROADSIDES

A Landscape Architect's ideas on roadside development planting from a functional and aesthetic viewpoint.

WILBUR J. GARMHAUSEN,
Chief Landscape Architect, Ohio Highway Department

LANDSCAPE Architects realize that the movement of motor vehicles rapidly, efficiently and safely depends not only upon what happens in the traveled way, but also upon what happens in the roadside areas. Well planned roadsides promote safety and ease of travel, and likewise improve the physical and functional character of adjacent roadside areas. The cost of maintaining roadside areas will be materially affected by the extent to which appropriate landscape techniques are integrated into their design and construction.

We are now embarking on the most dramatic highway construction era in the history of our country. Roadsides play an important part in this development. The wide right-of-way of future highways will put over 50 percent of the right-of-way into the category of roadsides. The many inter-related factors to be considered aim to provide all known features of safety and utility for safe and relaxed driving, for economy of operation and for pleasing appearance.

The Landscape Architect should be consulted on the designing of the highway; he should be along on the field check; and he should be present at the meeting of the contractor and the highway department at the time the plans are reviewed prior to starting construction.

Slopes should be kept as flat as practical. They should be rounded and warped to provide a smooth transition into the existing topography. In this way, the artificial appearance and uniformity of these slopes will be reduced. The advantages other than this are to encourage vegetative growth, reduce the problem of snow removal and permit easy operation of maintenance equipment. Flat slopes also promote safety and lessen the chance of serious accident if a motorist must leave the highway in an emergency.

Existing Plant Material

From a practical standpoint, the conservation of existing plant material within the roadside areas should reduce the need for new material and tend to keep down costs. Selective thinning should be done in wooded areas to conserve valuable trees and eliminate undesirable ones. Every effort should be made to salvage useful trees and other plant material. This material should be planted immediately, if possible, in a permanent location and not "heeled in." Trees that are near the bulldozing zone of work should be protected so that the operator of the equipment will stay a safe distance away from them and will not remove or damage them in this work operation.

When grading, topsoil should be saved and most specifications require the salvaging of this item, to be used at some designated place either on slopes, berms or planting beds. Stone and rock materials should be salvaged when available and needed for use in protecting embankments against stream erosion.

The selection of grass seed, fertilizers and mulches which are best suited to the area, soil, exposure and general climatic conditions is of great importance; but of equal worth is the preparation of the seed bed, keeping the mulch in place, and the other work operations vital to good results. The results must be a turf that will survive droughts, but not produce a succulent growth which requires mowing. It will have to be a turf that can be maintained by herbicides or inhibitors such as maleic hydrazide. A closely knit sod will reduce weed infestation and will lower maintenance costs by helping to prevent the deposition of eroded earth in highway ditches; stop gullying; permit the stabilization of shoulder soils; and prevent the blocking or undermining of culverts. The turf area must be maintained during the life of the contract, and weeds must not be allowed to mature.

Sod will need to be used in ditches or other areas that may have a tendency to erode before grass can be established by seeding. It is a good policy to have any extra quantity of sod set up for use in places that need to be protected, as in areas which do not show apparent need for it in the plan stage of development.

Courtesy Ohio Department of Highways

● **THIS view of State Highway 7, Washington County, Ohio., though taken some years ago, illustrates good roadside seeding practice, reducing maintenance costs.**

Good mechanical roadside equipment will help to keep the cost at a minimum and still give good results. It has been proved that a mulch laid down with a mulch blower gives a more even distribution and also stays in place better than one spread by hand. No traffic, either pedestrian or vehicle, should be allowed on the mulch after it is in place because once the spread pattern is broken it may be dislodged by wind action. It is important that mulch in ditches should be firmly secured otherwise it will wash and accumulate at the catch basins. An over-seeding of oats, maize, rye grass or other quick germinating seed is worth using. Consideration must be given ground covers which will reduce erosion on slopes and require minimum maintenance. All slopes 2 to 1 or steeper should be entirely planted so that no mowing will be necessary.

Planting of Trees and Shrubs

Functional planting of trees and shrubs is designed for specific purposes. When, for example, roadsides and medians are carefully planted, glare from oncoming headlights is reduced so that greater ease and relaxation is enjoyed by drivers. Appropriate planting can also relieve the monotony of long straight stretches by introducing variety and interest to the roadside and skyline scenery. This planting should be in large groups to create the effect of spaciousness, and done in such a manner that it will appear as a planting bed with no maintenance necessary within the bed area. It should be large enough to be effective when viewed at a speed of 60 mph. Planting design for a particular area should be based on need, ecology and maintenance. The planting should be a separate contract immediately following the completion of the general contract and after the project has been accepted by the state. This will not only allow the Landscape Architect to view the completed project to determine where the planting shall be done but an additional application of fertilizer can be given the turf areas and any areas needing special treatment can be covered in the planting contract.

Developing highways today that will be serving the public in an overall satisfactory manner not only entails the safe movement of vehicles but also the safe stopping and parking of vehicles well off the travel way. Much of the travel on the Inter-State Highway System is expected to be of the long haul type. The monotony, eye strain, and fatigue of constant driving justify the need for occasional, well located, well designed places where the motorist can stop safely well off the traveled way for rest and recuperation.

The design and selection of building materials should be such that it will require the minimum of maintenance. Toilets should be located near the parking area. Structures should be permanent material or of pressure treated wood. Parking areas should have concrete curbs and not guard posts, because even the pressure treated posts need to be straightened occasionally. If telephone booths are provided then light and telephone service wires should be installed from the rear of the property or by the shortest possible distance within the right-of-way.

NO MORE WATER WORRIES FOR RALEIGH

W. N. CARPER
City Manager
Raleigh, North Carolina

RALEIGH, N. C., has the reputation for being one of the few planned capitals in the United States. Typical of the city's many forward looking plans is the recent completion of Swift Creek Dam No. 2, to form a reservoir now known as Lake Wheeler.

This new 570-acre impounding reservoir was designed mainly for emergency storage use, and has more than doubled the former storage capacity of the city. By assuring an adequate supply for the foreseeable future, it should eliminate a water shortage that confronted Raleigh during periods of low rainfall. The reservoir holds approximately 2 billion gallons and is supplied by a 25 square mile watershed.

● **PLACING Armco interlocking sheeting for center cut-off wall of the dam.**

Construction on the project began in the summer of 1956. Land that would be under water was cleared to provide safety for future boating and other recreational uses of the lake. Along the shoreline all trees, stumps, exposed roots, shrubs, bushes and other vegetation were completely cleared between elevations 285.0 and 280.0. In deep areas below elevation 280.0, all vegetation under 8-inch diameter was removed. Trees over 8 inches were cut off 8 inches above grade; the trees were removed but stumps remained.

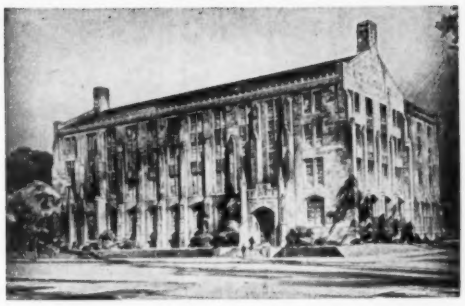
Length of the earth dam is slightly more than 700 feet. Maximum height above ground line is 30 feet. About 38,000 square feet of 7-gage Armco interlocking sheeting supplied in 20-foot lengths were used for the center core cutoff wall. Some sheets were driven as deep as 20 feet into the original ground. Splices were made and the sheeting was cut off at an elevation approximately 20 feet above ground line. The earth dam was gradually filled and compacted around the steel sheeting.

A concrete spillway, elevation 285.0 was constructed 8½ feet below the top of the dam. To protect the foundation of this structure, 1200 feet of 6-inch diameter perforated Armco Hel-Cor pipe was used as subdrainage beneath the spillway.

The dam was designed by Peirson and Whitman, consulting engineers of Raleigh. Dick Craig was resident engineer on the job and M. R. Cates was superintendent for the contractor, William Muirhead Construction Company of Durham, North Carolina.

● **SWIFT CREEK Dam No. 2 forms a new two billion gallon supply reservoir.**

News BULLETINS



AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

DON HERRICK RETIRES AS EXECUTIVE DIRECTOR OF APWA

Chicago, Ill.—At the close of this month, Donald F. Herrick, Executive Director of the APWA, will take off for his home in Cruz Bay on the island of St. John, U. S. Virgin Islands, via the retirement route. He leaves behind the indelible imprints of a job well done. Actually, retirement is the wrong term to associate with this man of well laid plans. The realization of an eight year old dream includes a promising business, still in the field of his life's work—sanitation—which will keep him active for many years to come.

Don, as he is known to his many friends, came to the American Public Works Association as its Executive Director in July of 1946. There followed a twelve year period of steady progress as is evidenced by a three-fold increase in Association membership. Under his guidance, the Public Works Congress & Equipment Show, sponsored annually by the APWA, has become the celebrated public works event of the year.

And so as the man of the familiar beret takes his leave, Robert D. Bugher, presently Assistant Director of the Association, steps up to the executive directorship by appointment of the Board of Directors. He has been a member of the Association staff since January 1953. Prior to his appointment, he served the Michigan Municipal League as Staff Engineer for five years and at the same time managed the operations of the Municipal Purchasing Service which renders consolidated buying services to cities and villages of that state.

Bugher has had primary responsibility for developing a number of the important programs of the Association. Not the least of these was laying the groundwork for the fifteen local chapters which have been formed since 1953 and carrying on the staff work of setting up the basic organizational procedures of the APWA Research Foundation. He is a graduate Civil Engineer of Purdue University and is a graduate of the school of Public Administration of the University of Michigan.

Editor's Note: It is with regret that we learn of Don Herrick's planned departure from the APWA headquarters where he has done so much fine work in the past twelve years, though we know he has looked forward eagerly to life in the Virgin Islands. Moreover, he will have the satisfaction of knowing that he leaves the Association's affairs in the hands of his capable successor, Bob Bugher. Our sincere best wishes to both Don and Bob in their new endeavors.

Local Chapter Activities

Several Chapters of the American Public Works Association held meetings during the last few weeks. Robert J. McNutt, City Manager of Harper Woods, discussed the advantages of the use of the short wave radio in the efficient operation of a public works department at the April meeting of the Michigan Chapter which was held at Huck's Inn in Redford.

The last meeting of the Northern California Chapter was held in Berkeley and featured a fascinating talk and demonstration on "Magnetic Recording and Its Effect on Everyday Living" by Phillip Gundy, President, Ampex Audio Company of Sunnyvale, California. The speaker reviewed the development of the recording of communications and sound leading up to the unbelievable accomplishments of the present.

The Utah Chapter held a Stag Dinner Meeting in Provo on Friday, May 2nd, and heard an informative talk by Dean K. Fuhriman, Professor of Civil Engineering of Brigham Young University, on "The Pollution on Utah Lake and the Effects of the Sewage Treatment Plants." The April meeting of the Philadelphia Metropolitan Chapter was highlighted by an illustrated talk on the "Manufacture and Uses of Wire Rope" by Messrs. David Burroughs and Lloyd Hill of Roebling and Company of Philadelphia.

The emergency resulting from last winter's "freak" snowstorm, which caused ten foot drifts in isolated parts of Northern Indiana, was discussed at the April meeting of the Chicago Metropolitan Chapter. The procedures followed during this emergency were discussed by the persons in charge of the snow clearing operations, including: John A. Kelley, City Engineer and William C. Zehnpfening, Consulting Engineer of Michigan City; Police

Captain James K. Trevey of the Civil Defense Office in South Bend and Joseph Beardmore of Chicago's Bureau of Sanitation, who supervised the personnel and equipment which Mayor Richard Daley of Chicago dispatched to the stricken area.

The Maine Chapter held its annual Spring meeting in Brunswick on April 15th, and toured the multi-million dollar, electronically controlled air defense installation at Topsham. The technical portion of the program included a film and talk by F. N. Cunningham of River and Sea Gabions, Inc., on the subject of "Gabions of Erosion Control". The second topic discussed was "Internal Sewer Surveys by Photography" by Malcolm Woronoff of Underground Photographic Surveys, Inc., and the third speaker was Graham S. Finney, Planning Director of Portland, who discussed the importance of subdivision controls to community development. A special program was also arranged for the ladies.

Charles Walter Nichols Award Nominations Now Being Accepted

Nominations are now being accepted for the 1958 Charles Walter Nichols Award, which is annually presented to a member of the Association in recognition of outstanding and meritorious achievement in the broad field of sanitation, which includes refuse collection and disposal, street sanitation, sewerage and sewage treatment and water purification and distribution. The award consists of an honorarium of $500 and a scroll describing the achievement. Any member may nominate a candidate for the award by simply writing a letter to the Nichols Award Committee, in care of the APWA in Chicago. The letter should briefly describe the achievement. Further information will thereafter be requested from the nominees for the award. All candidates must be active members of the American Public Works Association and engaged in full-time employment by a municipal government.

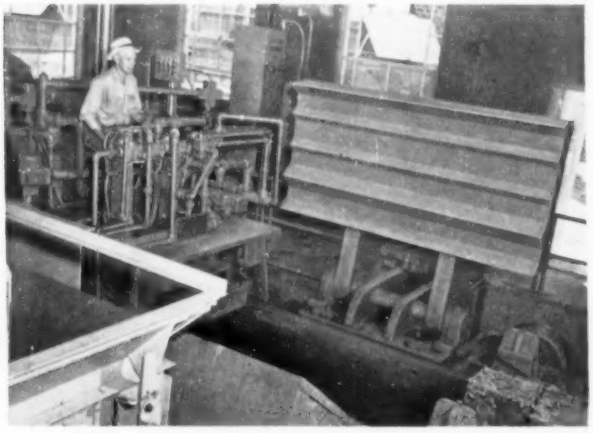
The recipient of the award will be selected by a Committee composed of Warren Coolidge, Consulting Engineer, Nashville, Tenn., Chairman; Dr. Morris M. Cohn, Editor, Wastes Engineering, New York City; and Hugo G. Erickson, City Engineer of Minneapolis, Minn.

Members are urged to submit the names of candidates at an early date.

How Louisville Incinerator Cuts Ash Handling Costs With the DEMPSTER-DUMPSTER System

DEMPSTER-BALESTER Turns Scrap into a $200,000 Boost for Taxpayers

Metal salvage is an important function of the Louisville Incinerator. Cans are processed, stored in a hopper and carried by dragline to a DEMPSTER-BALESTER scrap metal baling press. When the charging box is full, powerful hydraulic rams compress the scrap into a tight, easy-to-handle bale about 14″ x 14″ x 20″. Bales are ejected onto a conveyor, which drops them into waiting cars on the railroad siding . . . yielding the city an estimated $200,000 annually from scrap sales.



Like the proverbial packing house, Louisville's Incinerator "uses all of the hog but his squeal." Dried sludge is sold for fertilizer, and scrap metal is baled at a profit. Even the residue ash is valuable for land fill and dump sealers.

That's where the DEMPSTER-DUMPSTER System steps in. Six-cu.-yd. detachable containers are placed under the ash residue hopper to provide temporary storage. The containers are filled on a 24-hour basis and stored out of the way until they can be emptied by the day shift. This pays off in fewer trucks and bigger savings. Ash is hauled to the disposal area and automatically dumped by the one-man-operated DEMPSTER-DUMPSTER.

Hats off to Louisville and its progressive Director of Sanitation, John Leake. We are proud to be a part of one of America's model incinerators.

If you are planning or building a municipal incinerator, write us today. One of our sales engineers will call without obligation and explain our system.

Mfg. by Dempster Brothers, Inc.

DEMPSTER DUMPSTER®

DEMPSTER BROTHERS

Knoxville 17, Tenn. Dept. PW-6

Development and Maintenance of a SAFETY PROGRAM

THE SAFETY Program of the Department of Water and Sewers, of the City of Miami had its beginning on July 1, 1955, at which date the Water and Sewers Board appointed Claude F. Wertz as the new director of the department.

One of the first requests Mr. Wertz made to the Water and Sewers Board was for a Personnel and Safety Supervisor. He believed that a person with a good background in personnel management and industrial relations could not only reorganize and coordinate the department's personnel program, but could also develop and coordinate a full-scale program on a department-wide basis. His request was approved and Joseph M. Brown was transferred from the Civil Service Office to the Department of Water and Sewers as the new Personnel and Safety Supervisor. The fact that the new Personnel and Safety Supervisor was not entirely a stranger to the department and its 365 employees helped considerably during the development stages of the safety program.

Major steps in the development stages of the program included: 1) A complete review of all previous reports of accidents and injuries that occurred during the past everal years was made in order to determine the particular frequency rate and also the kinds of accidents which had taken place as well as their specific causes; and 2) after determining the previous accident experience of the department during the past several years, the next step was to get some expert advice on the proper methods and procedures to be used in correcting, controlling or eliminating the conditions or practices which had been causing the major portion of the most serious cases.

To assist in the program the following organizations, agencies, groups and individuals were contacted for the particular kind of advice, information, or assistance for which they were known to be best qualified to provide:

a) The Safety Engineer for the Insurance Carrier of the Workmen's Compensation Insurance was the first person contacted; b) the Safety Education Divisions of both the University of Miami and New York University were contacted and they provided outlines for organizing safety committees; c) a membership in the National Safety Council was obtained which enabled the Safety Supervisor to get considerable help, particularly in the development stages of the program; d) many of the Safety Engineers for local industry in the immediate area provided personal assistance and cooperation; e) Safety Engineers of other municipal water and sewer plants of comparable size were also contacted for advice, and they were most cooperative; f) the skills of the various safety authorities of the city, county, state and federal governments were also utilized; g) Safety Manuals were obtained from the AWWA, FSIWA, the National Safety Council and other sources; and h) various medical associations in the local area, as well as the county, state and federal governments, supplied valuable data, particularly for sewage treatment plant operations.

One of the first projects on a department-wide scale was first aid classes. These classes are conducted by the Rescue Squad from Miami's Fire Division; squad members have taught several classes in the standard and advanced courses and will soon begin an instructors' class.

After the instructors' course is completed, the department will be able to supply its own instructors to teach every employee in the entire department in the standard course; and perhaps some of the key personnel also will receive the advanced course.

Other courses in safety and accident prevention were provided by the Industrial Safety Department of the Florida Industrial Commission and the Gas Hazards Division of the United States Bureau of Mines. This training provided the employees with all the fundamental and basic principles of safety education, job hazards and many other subjects pertinent to the specific types of operations and activities found at a large water and/or sewage treatment plant.

In addition to, and concurrently with, the projects mentioned, the Safety Supervisor organized safety committees in each of the various divisions. Each committee has a chairman, and both chairman and

Well-Lighted Municipal Parking Lot

NEW AREA LIGHTING improves this municipal parking lot in the heart of Plainfield, New Jersey. The lighting consists of Pfaff & Kendall "Luxaire" fluorescent units on a davit standard. The twin Luxaires provide a high lumen output at a low power factor, offering excellent lighting intensity for a minimum of cost. An interesting method of avoiding damage to the standards by auto bumpers was to set the base of the standard on concrete foundations above the pavement grade.

THESE COMMUNITIES *(and others)*

USE THE C-E RAYMOND FLASH DRYING SYSTEM FOR SEWAGE SLUDGE DISPOSAL

it's your best bet too!

All over the country—in communities large and small—the C-E Raymond System is used for sludge drying or incineration.

And with good reason: This is the only system available that permits flash drying or incineration, separately or together, in any proportion.

High temperature deodorization and efficient ash collection equipment can be designed integral with the system.

Call a C-E engineer for detailed help in planning an installation to help your community end its disposal problem. Call the Combustion office nearest you.

C-156

For further details on the C-E Raymond System—and data on more than 40 installations—mail this coupon to Combustion Engineering, Raymond Division, 200 Madison Avenue, New York 16, N. Y.

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COMBUSTION ENGINEERING

RAYMOND DIVISION

1315 North Branch Street, Chicago 22, Illinois

Eastern Office: 200 Madison Avenue, New York 16, N. Y.

Western Office: 510 West Sixth Street, Los Angeles 14, Calif.

committee members have alternates who fill in at meetings during the absences of the "regulars." Chairmen are elected for a period of one year, but committee members rotate every three months.

This turn-over of committee members every three months not only gives all the employees a chance eventually to serve as a member of the committee, but also enables the chairmen to have a constant flow of new ideas coming up at their weekly safety meetings.

Once each month, the Safety Supervisor conducts a general meeting in each of the larger operating divisions. Outside speakers are presented to give safety talks and lectures on accident prevention or, as substitute for the "outside experts," the Safety Engineer of the Workmen's Compensation Insurance Carrier may show films about the various phases of safety education and training.

Occasionally, one or more of the employees may put on a demonstration, showing the right and wrong ways to perform certain operations; or provide instruction, advice or information about one or more of the operations or activities encountered in their daily work routines.

Some of the safety innovations that have been introduced and adopted since the program started include: 1) Periodic inspections of the plant and all of its machinery, structures and facilities; 2) safety rules and regulations for all types of work methods, practices and procedures; 3) safe driver programs for the operation of both commercial and passenger motor vehicles; and 4) provision of adequate and appropriate personal protective equipment and facilities, such as gloves, hard hats, eye protectors, foot and shin guards, safety-toe shoes, machinery guards, adequate lighting, sanitation and hygienic items and facilities.

The Safety Program in the Miami Water and Sewer Department had been in existence exactly two years when participants became aware that it was actually beginning to pay dividends in the reduction or elimination of human suffering; in increased production, service and efficiency in the uplift of employee morale; and also in money.

The Insurance Carrier announced in December, 1957, that it was crediting the department with approximately one-fourth of the premium for the past year because of its excellent accident-experience record during the 1956-57 fiscal year. The amount was almost $5,000.

In addition to the premium credit, three of the department's divisions received Safety Achievement Awards and 293 employees were awarded Safe Worker pins and certificates. The pins and certificates went to those employees who did not suffer a chargeable accident in the fiscal year.

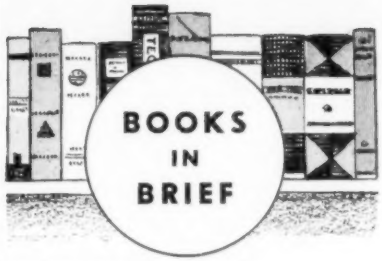
The Motor Vehicle Insurance Carrier, in addition, advised the department it had earned a premium credit of approximately $1,000 on this type of insurance during the same fiscal period. This brought the net earnings in premium credits of the department to almost $6,000.

Safety experts and engineers hold that, for every dollar earned in premium credits, there are four hidden dollars saved in other phases of operations. By this yardstick, the Safety Program in the City of Miami Water and Sewers Department realized savings of $25,000 in the 1956-57 fiscal year.

• • •

Every Street Is Paved

Every street—seven miles of them—in Union Springs, Ala., is now paved.



MUNICIPAL AND RURAL SANITATION

Since its appearance in 1927, this book has been considered one of the fundamental texts for training public health workers. To extend its 30-year span of popularity, Victor M. Ehlers, Texas State Engineer, and Ernest W. Steel, Professor of Sanitary Engineering at the University of Texas, have prepared a fifth edition. Like its predecessors, this edition presents the panorama of sanitary principles and practice in a manner easily understood by all who have the educational background to enter any of the professional phases of the field. This fifth edition, however, involved a major effort in overhauling the previous texts with several chapters completely rewritten, two new ones added, and the rest made up-to-date. The rewritten chapters are on communicable diseases, water-carriage excreta disposal, water supply and treatment, refuse sanitation, and insect and rodent control. The revisions have included combining several chapters for easy reading and reorganizing the material to present a modern approach. Radiological sanitation is the topic of a new chapter; what the public health worker should know about schools, nursing homes, hospitals, and jails serves as another one with the heading "Institutional Sanitation."

Some of the distinctive features of the new work are the simplified introduction to the language of radiation hazards, detailed discussion of refuse collection and disposal by sanitary landfill, full instructional material on the formulation and application of larvicides and adulticides for mosquitoes and flies. The eight years intervening between the fourth and fifth editions have made necessary the addition of much new material; for example, portions of the text are rebuilt around the Milk Ordinance and Code (1953), the 1957 Joint Committee Report on bathing place sanitation and the Housing Act of 1954. But the scope, objectives and style of previous editions have been preserved in this 596-page work, so that the book still explains basic sanitation for engi-

Mechanical Washer Speeds Tunnel Cleaning

The Bankhead Tunnel, Mobile, Alabama, employs the one man operated, Ross and White Mechanical Tunnel Washer to remove accumulations of dirt and exhaust deposits.

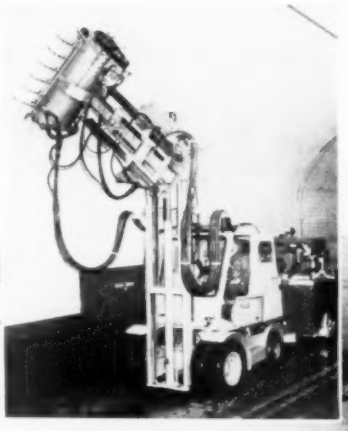
Difficult, costly, time consuming and most manual cleaning problems are eliminated.

Designed in collaboration with Palmer & Baker Engineering Company of Mobile, Alabama. The Ross and White Tunnel Washer scrubs and rinses walls and ceilings as it moves in the direction of traffic.

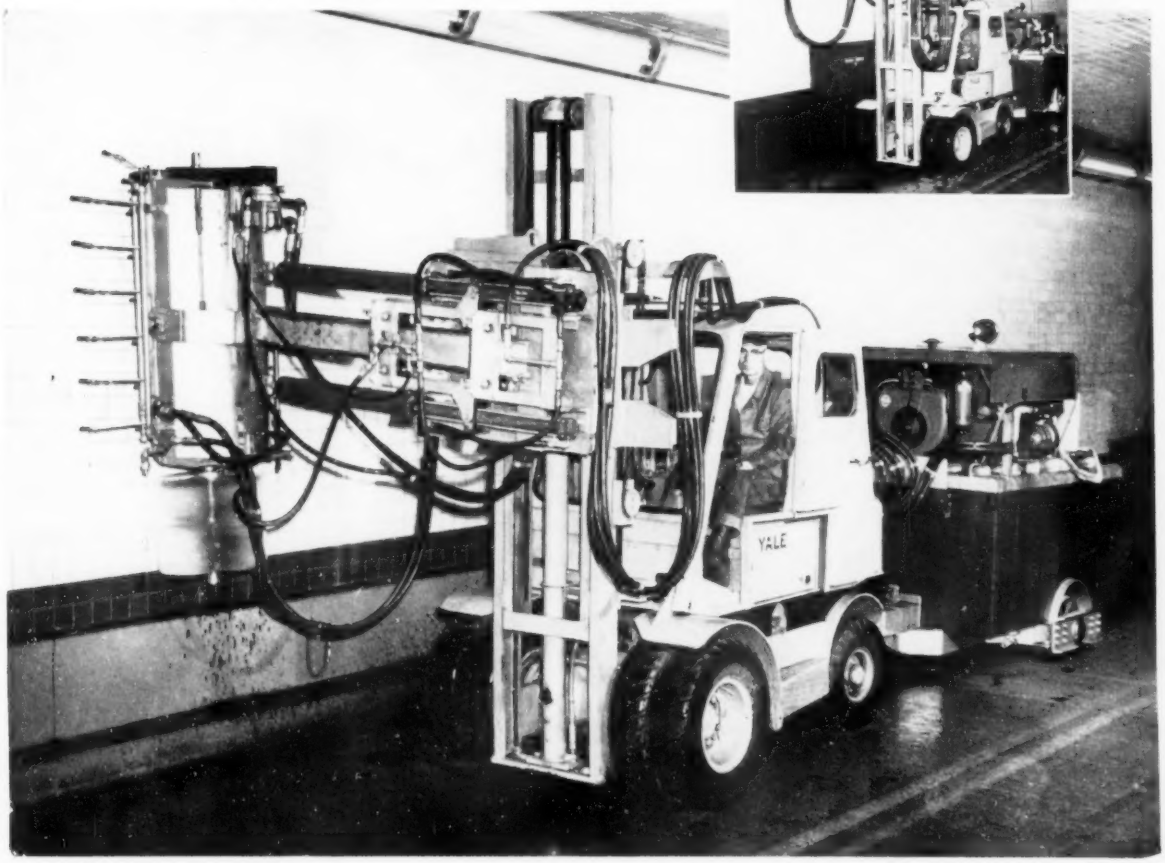
The cab of the lift truck, which furnishes the motive power, contains all controls within easy reach for operating a high speed rotating Nylon Brush with spray components and allows the mechanical manipulation of the brush horizontally, vertically, and in various degrees of inclination to properly contact all contours.

Area of tunnel surfaces to be cleansed determines the size and capacity of the tank trailer.

Let us know your requirements.



Ross and White Tunnel Washer operating in the Bankhead Tunnel, Mobile, Alabama. Note positive contact of rotary brush with curved surface.



All movements of brush are accomplished hydraulically. Power is supplied by 25 HP power-pak mounted on tank trailer which also operates water and detergent pumps.

MANUFACTURED EXCLUSIVELY BY

ROSS AND WHITE COMPANY.

CHICAGO DAILY NEWS BUILDING, CHICAGO 6, ILLINOIS

neers, sanitarians, physicians, dentists, nurses, and administrators alike. Anyone whose professional activities touch any of the phases of sanitation will find this a reference of value, if it serves no other purpose than placing his responsibilities in their proper perspective, from the standpoint of public health. The publisher is McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y.; the price is $9.00.

DOMESTIC WATER SUPPLY IN CALIFORNIA

The California Department of Public Health, 2151 Berkeley Way, Berkeley, Calif., E. A. Reinke, Chief, Bureau of Sanitary Engineering, has issued a booklet containing information on all water systems in the state having over 200 service connections. This represents data collected since 1950 and some of the information is therefore rather old. Data includes: Place and owner; source and works; population served; water use; and chemical analyses of the water. There are 53 pages of tables listing about 800 installations.

METHODS AND MATERIALS FOR JOINT AND CRACK SEALING

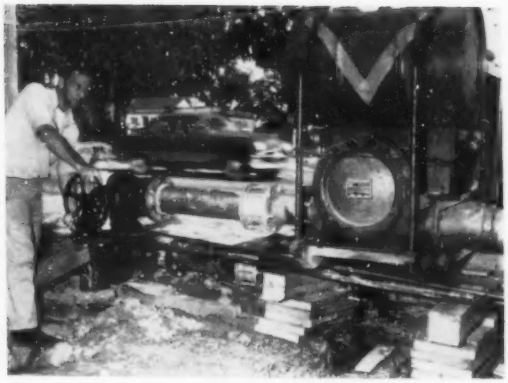
Bulletin 166 contains two papers on joint and crack sealing. L. A. Fickes and C. C. Rhodes wrote on "A Field Study of Joint and Crack Sealing Methods and Materials," and Egons Tons and Vincent J. Roggeveen wrote on "Field Testing of Materials for Sealing Cracks and Joints in Bituminous Concrete Resurfacings." Copies are available from the Highway Research Board, 2101 Constitution, Washington, D. C., and are 80¢ each.

NEW YORK CITY DEP'T. OF PUBLIC WORKS

The annual report for 1957 of the Department of Public Works of New York City, F. H. Zurmuhlen, Commissioner, is a beautifully prepared booklet of 120 pages, covering in considerable detail the many activities of this large and progressive department.

DELAWARE RIVER PORT AUTHORITY

An excellently prepared and interesting booklet on the 1957 work of the Delaware River Port Authority has been sent us by Joseph K. Costello, Executive Director, Bridge Plaza, Camden 1, N. J. It contains much traffic and financial data on the Delaware River Bridges.



● BY OPERATING this valve, water is passed to the first of the two Gorman-Rupp centrifugal pumps shown.

● DUAL arrangement of the pumps. Either or both can be connected at one time. A third pump (not shown) is kept ready for emergencies.

MOBILE PUMPING UNITS
ASSURE WATER WHILE LINES ARE LAID

BECAUSE the water demands of suburban householders fluctuated sharply with changes in weather conditions, the Cleveland, Ohio, Department of Public Utilities faced the problem of maintaining pressure in a populous outlying area. Civil Engineer Roy M. Mumma and his colleagues in the water and heat division assured an ample supply of water at satisfactory pressures for suburban Strongsville by a temporary installation of two centrifugal pumps.

The pumps (Gorman-Rupp Model 55 H/503), powered by gasoline engines, are tied into a 12-inch main and are positioned at different levels above the ground so that piping and valving can be used for either or both, as required. Workmen are dispatched to the location day or night to turn the water on or off, and to start the pumps and shut them off to meet changing demands.

Beautification Board Projects

The Beautification Board of Birmingham, Ala., had, as its first project, cleaning the trash and rubbish from the parkways on the city's four-lane streets.

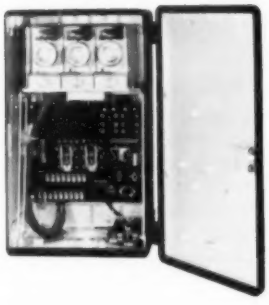
WE ARE NOW  IN A POSITION TO  PROVIDE

YOU WITH NEW EQUIPMENT.  ALSO MAINTENANCE

PARTS FOR 

TRAFFIC 

SIGNALS AND

CONTROLLERS  AS FORMERLY SUPPLIED

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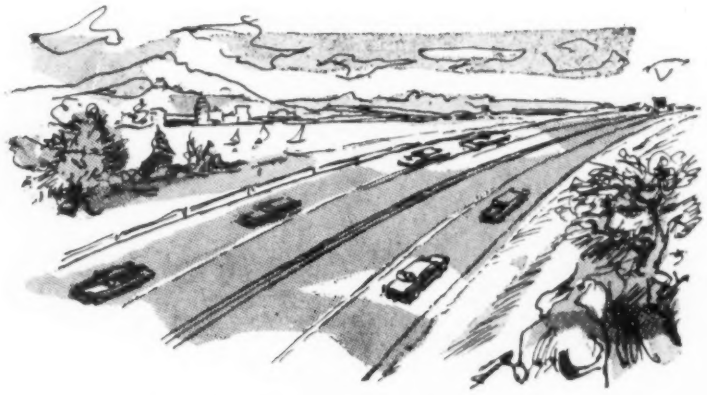
Whats New

in Machinery and Construction Methods for Bituminous Paving

H. A. RADZIKOWSKI,
Chief, Division of Development,
Office of Operations,
Bureau of Public Roads

Condensed from a paper presented at the Asphalt Conference, Iowa State College, Ames, Iowa, February, 1958.



AT THE end of 1946 there were 400,755 miles of bituminous surfaced rural highways including 305,483 miles of low type bituminous and 95,272 of high type bituminous. By the end of 1956 the total rural mileage of bituminous pavement was 701,086 miles, including 453,591 miles of low type and 247,495 miles of high type.

In analyzing the trend in low type bituminous in the 10-year post war period, it is significant to note that the rate of increase was nearly 4 times greater on county and local highways than on State highways. This is indicative of a substantial increase in traffic on county trunk routes as well as an effort to conserve the supply of fast depleting aggregate deposits. Studies made by the Bureau of Public Roads indicate that from a standpoint of maintenance costs, bituminous surface treatments are more economical than gravel for traffic intensities above 150 vehicles per day.

One of the newest equipment developments which will be of considerable value for utilizing poor grade local gravels is the aggregate upgrading machine. This makes use of the fact that the objectionable soft particles have substantially different elastic or bouncing properties from hard durable stones.

Stones from the pit are conveyed into an overhead bin; then by gravity to a vibratory feeder; from the lip of the feeder they drop in a required pattern on the surface of an inclined plate made of hard alloy steel. The hard particles will bounce so as to produce a characteristic distribution curve while the softer stones will fall into a consistent but different curve pattern of shorter arc. Bounced stones are collected into three separate compartments according to their elasticity.

Another equipment development is the electronically controlled fine grader attachment for a motor grader. This device maintains the grader blade in a level position or to a desired crown slope without interference from the irregularities which are encountered by the grader wheels.

Compaction Equipment

The multiple pad type vibrator, employing either electrical or hydraulic vibrating principles, has been used extensively in compacting subgrades and macadam and granular base courses with outstanding results. Last year a roller manufacturer added several vibrating pad units as an attachment to a 3-wheel roller. The unit is suspended from the rear and may be lowered from travel position hydraulically.

Other compacting equipment which employs the dynamic force principle includes the towed and self-propelled vibratory rollers. The towed types have been used principally on subgrade and base compaction with good results reported.

Last year a self-propelled roller of German manufacture was introduced in this country. The unit is highly transportable since it weighs only 4 tons. Under vibration, it is claimed to have the compacting ability of a 20-ton roller. The vibrating unit is in the driving wheel and can be varied for various soil conditions by means of a split pulley arrangement. No vibration is transferred to the frame or operator's quarters due to an effective damping system.

Another smaller self-propelled roller, marketed by an American manufacturer, is adaptable for maintenance and light construction. The weight can be varied between 2300 to 3500 pounds and it is said to give the compaction equivalent of an 8-ton roller.

Also available for maintenance purposes are a number of single pad vibratory compactors which do an excellent job of compacting bituminous patches and ditch backfills, particularly in the case of utility cuts in pavements.

Several years ago an equipment manufacturer introduced a dual purpose roller having both steel wheel and pneumatic rolling units propelled by a two-wheel tractor and having a wide range of contact pressures through ballast adjustment. Last year the versatility of this machine was further increased by adding a trailing vibratory steel wheel roller and by providing alternate pneumatic and sheepsfoot rolls which are interchangeable with the steel roll located under the ballast box. The two-axle pneumatic roller adaptation is designed with the front and rear tires staggered one-half the tire-width.

Another new device which was designed to keep abreast of the trend toward greater use of stabilized bases is the stabilizing plant. This is essentially an elevated pug-

How Highland Park stopped sewer trouble before it started

Lining the failing sewer with 54-inch-diameter Armco Liner Plates allowed the greatest possible waterway area to be salvaged.

Before lining it had been necessary to install timber struts to prevent total collapse of the original sewer pipe.

City officials at Highland Park, Illinois, discovered a failing 60-inch-diameter rigid pipe storm sewer. The structure had to be strengthened or replaced before it collapsed. To eliminate the time, trouble and cost of complete replacement, engineers decided to line it with 54-inch-diameter Armco Liner Plates. Space between the Liner Plates and the original sewer was grouted.

Armco Liner Plates can help solve *your* underground construction problems too—whether you are installing new sewer or utility lines or strengthening existing conduits. There are no open trenches to disrupt traffic, no troublesome detours. Merchants and shoppers are not inconvenienced.

Send the coupon or ask us for complete details about Armco Liner Plates. Armco Drainage & Metal Products, Inc., 5338 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO DRAINAGE & METAL PRODUCTS, INC.
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Send me details about
☐ Armco Liner Plate ☐ Lining Failing Structures

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Organization _____

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City _____ Zone _____ State _____

ARMCO
Liner Plates

mill with receiving and discharge hoppers and means for adding water or bituminous materials. The rated capacity is 400 tph. Stabilization of deficient local materials with calcium chloride, cement or bitumen by controlled mixing is another method of conserving our decreasing supply of good roadbuilding materials.

The new equipment developed for measuring moisture and density includes a bomb-type device used by Florida for obtaining moisture content. Moisture content is determined by the pressure generated by the gas produced when calcium carbide is added. Another new instrument obtains both moisture and density of soil foundations. This device is based on the varying degree that radioactivity is scattered when placed in contact with materials of different moisture content or density. Measurement of the amount of scatter is equivalent to measurement of moisture content or density.

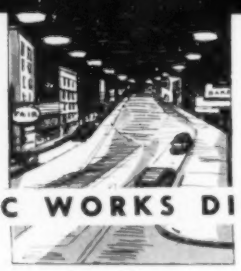
As a step toward greater use of result specifications on bituminous paving, the California Division of Highways has under development a collapsible and portable profilometer which can be carried in the bed of a pickup truck. It will produce the deviation from a smooth profile over a 25-ft. length; and will record the deviation profile on paper and on the road; the road profile can be used by the paving contractor to correct surface irregularities while the bituminous mat is still warm.

Mixing Plant Controls

With the use of electric and hydraulic controls and timing devices, one man can start a bituminous mixing and processing plant and watch it go through the various cycles of automatic batching, dry mixing cycle, weighing and introduction of asphalt, wet mixing cycle, and discharge the mix to trucks. Should the supply of any size of aggregate in the storage bin be inadequate for the requirements of the batch, the mixing operation automatically stops until this is supplied at which time the mixing cycle automatically continues. With these automatic controls it is possible to proportion accurately all sizes of aggregate simultaneously; also to have some cycles overlap, such as weighing the second batch while the first batch is being mixed and discharged from the pugmill.

The automatic features show their greatest economies when there are a considerable number of repetitive batches of the same gradation. Should the plant be set for automatic oper-

(*Continued on page* 182)



Prepared by

FRANK FORCE

Associate Editor

THE HIGHWAY AND AIRPORT DIGEST

How to Install Subdrains That Won't Clog

Clogging can be prevented before trouble begins by specifying filter material of the right gradation, and by job supervision to see that the job is done right in subdrain construction. The Corps of Engineers through tests have found that the 15 percent size of the filter material must not exceed 5 times the 85 percent size of the adjacent soil material if this adjacent material is to be prevented from passing through the filter and clogging the drain. The 15 percent size, however, need not be less than 0.1 millimeter if the soil is cohesive. To obtain a satisfactory permeability ratio, the 15 percent size of the filter material should be greater than 5 times the 15 percent size of the soil. Also, to prevent segregation of the filter material, its uniformity coefficient, the ratio of the 60 percent grain size to the 10 percent grain size, should not be greater than 20. One of the best ways to prevent segregation during placement is to have the material in a moist state. One of the objectives of these tests was to determine the amount of filter material that would wash into the pipe. Armco Hel-Cor pipe was used and it was found that the best position for the perforations is in the zone approximately 30° down from the horizontal axis; also that practically no filter material entered the 5/16-in. holes.

"Tests on Filter Sands Show How to Install Subdrains That Won't Clog." By J. M. Robertson, Supervising Engr., Armco Drainage & Metal Products, Inc. *Better Roads*, April, 1958.

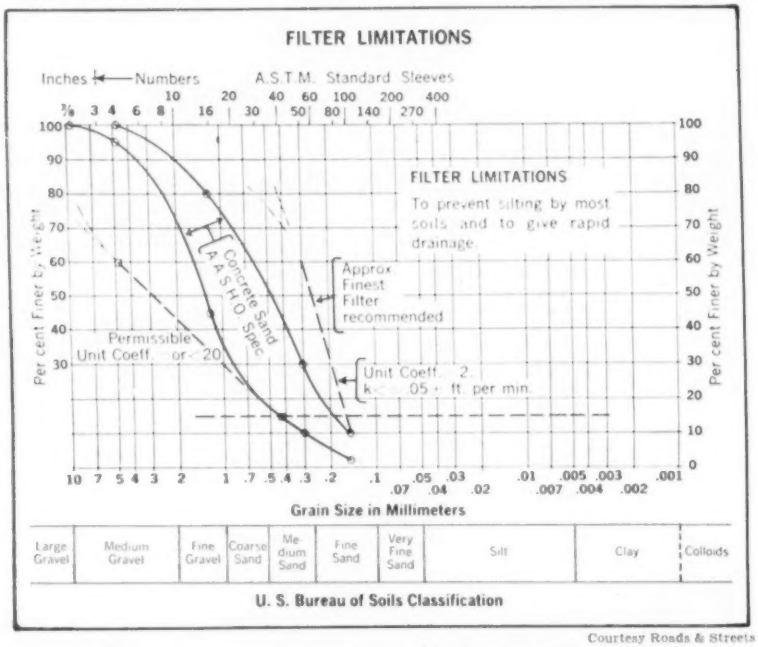
Plastic Bags For Soil Moisture Samples

The Texas Highway Dept. is using plastic bags to transport moisture samples from the job to the laboratory without loss of moisture. The bag measures 9-ins. by 18-ins. by 0.004 of an in. thick. They cost 5¢ each and their life, depending upon the type of soil, is very good. After a sample is placed in the bag, it is sealed with a rubber band. The sample is weighed in the bag and removed to a pan, then placed in the oven for drying. The bag and rubber band are weighed and recorded as tare weight (average weight is 18 grams). Moisture in the bag is removed by turning the bag inside out. The bag is weighed before and after removal of moisture and the difference recorded along with the moisture in the sample.

"Plastic Bags For Soil Moisture Samples." By N. A. Billingsley, Jr., Senior Laboratory Engineer, District 8. *Texas Highways*, March, 1958.

Solving Our Parking Problems

The growth in the use of the motor vehicle as a form of transportation is the primary reason for the parking problem and the second reason is the conflicting interests of the many groups in the community. The responsibility for the improvement of parking must be delegated. The four steps necessary in solving the problem are: 1) Collect and analyze facts; 2) locate and design needed facilities; 3) inaugurate a financial plan; and 4) provide public education and obtain its support. Essentially the collection of facts consists of measuring the supply (inventory) and demand (survey) for parking, while the analyzation is the comparison of supply and demand. The methods used in measuring the parking demand are the cordon count method, interview method, post-card check, non-interview field study, land use studies, meter income method and the photographic method. In the development of parking, facilities which cost the least (right-of-way and construction costs) are not necessarily the most economical. A rule of thumb to use in locating parking facilities is that they should be not further than a block and a half away from the central core in a community of 25,000 people and not further than approximately three blocks away in a city of 200,000 people. The basic components of a parking facility design are access, storage and exit. The four principal methods of financing parking areas are: 1) bond



Courtesy Roads & Streets

● **GRADATIONS for porous materials suitable for installation of subdrainage.**

CreZon Keeps A'G'A Signs Waterproof

● Turnpike signs take a beating 24 hours a day! But despite scorching sun and freezing winds, GPX* Green with its CreZon overlay really stands up.

This is what the Elastic Stop Nut Corporation of America has found from its extensive use of CreZon along Eastern highways.

The grainless, two-sided GPX Green withstands the worst weather without checking, splitting or grain rise. This CreZon overlaid plywood saves labor in the shop because it works easily and paints quickly.

Next time you construct road signs—whether large or small—construct them of CreZon overlaid plywood.

*GPX is a registered trade mark of Georgia-Pacific Corporation

the permanent protective overlay for plywood

CreZon®

CreZon overlaid plywood is available from leading plywood manufacturers under various brand names

CROWN ZELLERBACH CORPORATION
343 SANSOME STREET SAN FRANCISCO CALIFORNIA

issue; 2) assessment; 3) parking meter funds; and 4) general funds. Public support may be obtained through communications which involve mass communication and personal communication. In order to plan properly toward obtaining public support, a time schedule for public information should be made at the beginning of the study. Keeping the communication representative informed, making them feel free to request additional information is the best way of getting support.

"Solving Our Parking Problems." By Adolf D. May, Associate Professor, Highway Traffic Safety Center, Michigan State University. PUBLIC WORKS, May, 1958.

Setting Up a Computer Center

The interest in electronic computers at Michael Baker, Jr., Inc., was generated as a result of the need for conserving engineering manpower and time to meet the demands of the expanding highway program. During the past two years Michael Baker has conducted a research analysis of their needs, selected and trained a computer staff, established a computing center and installed an electronic computer data processing system. A study indicated that 4 types of problems in particular involved repetitive operations; bridge and interchange geometrics, earthwork and traverse and structural computations. In cost studies it was found that the break-even point in repetitive work would be reached if 50 percent of all earthwork computations, 5 percent of the total bridge design activity, and 33 percent of all traverse computations were allocated to the computer. It was decided that operations could best be accomplished through the use of an intermediate size unit. An IBM 650 computer and related peripheral equipment were leased by the company; 20 design engineers and technicians were used to program the computer. This staff attended a comprehensive series of courses for 3 months given by IBM to train them in programming and the operational use of the 650. To accomplish efficient communications between design offices and the computing center, all prepared programs are announced in advance by use of a program abstract. Following this abstract, a Users Manual, giving information on solutions involved, instructions on the submittal of data forms and any necessary data forms is given to all design sections. The final publication is an Operating Manual which shows sample solutions, block diagrams, keypunch instructions and operator's instructions.

"Setting Up a Computer Center." By Edgar C. Richardson, Michael Baker, Jr., Inc., Rochester, Pa. *Consulting Engineer*, April, 1958

How the Road Departments Handled Winter Storms

This is a review of what happened to highways during the snowstorms of 1957-58. During the storms, roads were blocked, power lines were down, road travelers were marooned and farm houses were cut off from civilization for days at a time. The Colorado Dep't. of Highways spent approximately $800,000 on snow removal. Kansas Highway Dep't. was able to take care of the storm with its own equipment and did not have to call for outside help. Plenty of snow fell in the state and it was an unusually wet winter. High winds caused serious drifting in Nebraska and many highways were closed to traffic. Maintenance crews worked with every available piece of equipment night and day to free the highways of 4, 5 and 8-ft. drifts. Iowa had very little trouble with the storms and roads remained open. Indiana

WHAT'S NEW in portable rollers? *Meet the 4-6 ton KT-8 . . .*

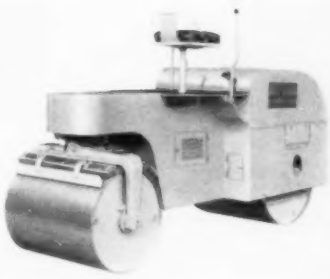
Towing wheels are never in the way because they *FOLD AWAY!*

Hydraulically powered towing wheels "fold away" into the main frame to give the *new* 4-6 ton Buffalo-Springfield® Model KT-8 Portable Tandem Roller some unique advantages never before offered *in any other roller!*

The KT-8's exclusive "fold away" feature permits maximum ground clearance . . . and completely *eliminates excessive overhang!* The KT-8 can work in tight corners . . . around obstacles . . . up against high curbs and forms . . . without removing the wheels. And the new "fold away" design lets the operator actually *see* his work at all times!

Hydraulically powered towing wheels save time on every move — speed work schedules. The KT-8 is ready for transporting in *minutes* . . . and ready to go to work just that fast at the next site!

There are other important features, too. Torque converter drive *automatically* matches power to grade and material variations . . . permits infinitely variable speeds from 0.5 to 5.3 mph in either direction. Heavy-duty, high-speed, low-torque clutches provide smooth reversing without grabbing. Wide faced bevel gears assure long, trouble-free operation. *The KT-8 is built for maximum performance, dependability and durability in every respect!*



A new 3-5 ton Portable Tandem KT-7A is also available. While it does not have hydraulically-powered towing wheels, it does offer towing attachment as optional equipment. Attachment includes towing hitch with hydraulic jack, stub axle assemblies with pneumatic-tired wheels, and wedge blocks. See your Buffalo-Springfield distributor for a demonstration on either model — KT-7A or KT-8.

B-800-N

BUFFALO-SPRINGFIELD ROLLER CO.

DIVISION OF KOEHRING COMPANY • SPRINGFIELD, OHIO

was hard hit with all roads closed from time to time. In Illinois it was necessary to add to the regular snow-fighting equipment in several areas to combat the huge drifts. Bulldozers and graders were obtained from contractors to aid in the battle. Michigan anticipated the worst and was prepared for it. Pennsylvania threw into its worst storm 1,984 pieces of its own snow-removal equipment and rented 210 more pieces. An additional 1,018 pieces of equipment had to be rented during the emergency. One storm alone cost the New Jersey Highway Dep't. $1,000,000 to plow the 1,838-mile state highway system. At the height of this storm they had 2,300 men and 850 pieces of snow-removal equipment on the highways. New York State used its own equipment and rented other units. Virginia used 6,000 employees on snow removal and hired a great deal of equipment.

"How the Road Departments Handled Winter Storms." *Better Roads*, April, 1958.

Don't Ignore Soils Studies

To bring this point more clearly into focus for all even indirectly concerned with the business of construction, this article is a rather basic, concise, yet comprehensible, symposium on the many aspects of soils studies. This is the "why"—not the "how." All specialists in their fields, the authors wrote on the subjects of taking good soil samples; testing them properly; using the results in the working job; and the tools needed to do it; then on to more specific applications to highways, flexible pavements, piles, bridges, tunnels, buildings and earth dams. Finally to what's new, in-place paving by chemical stabilization; and large area studies by air photo interpretations.

"Don't Ignore Soils Studies." By M. D. Morris, Vice President, Testlab Corp. PUBLIC WORKS, May, 1958.

Tar—The Answer To The Water Problem

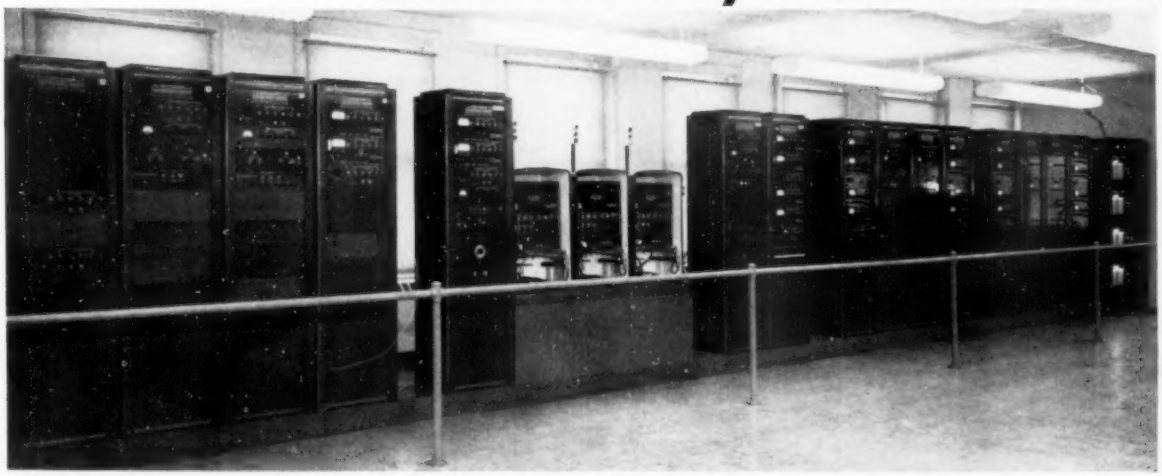
In Britain tar is being used to seal sub-soil formations and sub-bases, to seal temporary running surfaces and to seal open-textured macadam surfaces. There are 3 methods that can be employed to keep water out of the road structure: 1) A double surface-dressing of hot tar to the surface of the base before the surfacing materials are laid; 2) by laying the base-course of a two-course surfacing and sealing it immediately pending the laying of the wearing-course; and 3) by laying an impervious wearing-course immediately after construction of the base has been completed. Dense tar surfacing has exceptional resistance both to skidding and to the effects of oil droppings and it never polishes under traffic. With open or medium textured wearing courses, a surface-dressing of hot tar and small chippings is necessary if moisture is to be kept out. Surface-dressing with hot tar and chippings has proved a most economical and efficient method of rehabilitating a worn bituminous carpet, or an old surface-dressing on an existing road. The tarred chippings were applied, and flowed freely, through the normal type of gritter and proved to give immediate adhesion, with an absence of "fliers," under fast traffic.

"Tar—The Answer to the Water Problem." By P. S. Ledger-Lee, Technical Officer of the British Tar Association. *Municipal Engineering*, March 28, 1958.

Delaware's 60-40 Urban Street Program

With the passage of Delaware's Municipal Street Aid Fund Law, and the first distribution of money

800 BALTIMORE Traffic Signals Electronically Coordinated



ELECTRO-MATIC® PR SYSTEM unplugs traffic bottlenecks

There's something noticeably new in Baltimore — traffic moves, and in orderly fashion, too. In a few short years, Transit-Traffic Commissioner Henry A. Barnes, has turned Baltimore, which had been called "the city with the most antiquated signal system of its size," into a city that boasts the most modern, efficient signal system obtainable.

Baltimore's PR System is an advanced combination of modern electronics. Radar Detectors are used to sample key traffic flows for the centrally located battery of Electro-Matic Masters shown above. The highly developed computing circuits of the Masters analyze this flow data and send to the 800 all-electronic PR Locals throughout the city the necessary instructions to set up the most effective timing pattern for traffic conditions of the moment.

For details write for Bulletin E-224B.

AUTOMATIC SIGNAL DIVISION
EASTERN INDUSTRIES, INC.
NORWALK, CONNECTICUT

to 51 municipalities, the world-wide complaint of taxation without direct benefit is no longer quite so valid in Delaware. Two basic factors were taken into consideration in the writing of the law. They were population being served and the mileage of streets which must be maintained by the town. It was recommended and written into the present law, that 60 percent of the funds available be distributed in the proportion to the mileage of streets not maintained by the state with the total mileage of streets, not state-maintained, in all incorporated communities. It was recommended, and approved, that the remaining 40 percent be distributed in the proportion to the population of all the community with the total population of all incorporated communities. Under the 40 percent population factor the funds accruing to the town shall be used for street improvements, including expenses for maintaining and lighting of streets and acquisition of cars and other equipment for law enforcement. A certain proportion of police and maintenance salaries may be paid from the fund. Also, the money may be used for the purchase of rights-of-way for new streets and for improvement and maintenance of them. Under the 60 percent mileage factor those funds available shall be used for street improvements, including their maintenance, for the payment of principal and interest on any bonds issued for street improvements and for the purchase and repair of street construction and maintenance equipment.

"Delaware's 60-40 Urban Street Program." By R. A. Haber, Chief Engineer, Delaware State Highway Department. *The American City*. April, 1958.

Liquid Chemicals For Dust and Ice Control

Liquid calcium chloride as a chemical treatment for dust and ice control has been used by the Ottawa County Road Commission in Michigan. For dust control, two types of application were used. One was a spot treatment, 500 ft. long and 12 ft. wide, in front of each house. The average amount of chloride of the 38 percent material was 120 gallons per application. The other type of treatment was a continuous application, which was also 12 ft. wide and which required an average of 1200 gals. per mile. The above rates of applications are equivalent to one pound of flake calcium chloride per square yard. For ice control, a 20 to 23 percent calcium and magnesium chloride is used with a 5 to 6 percent of sodium chloride. This material is used because the 38 percent materials would solidify at freezing temperatures and could not be handled. On roads that are covered with packed snow that is from $\frac{1}{2}$-in to 1-in. thick, a load of 1200 gals. will cover approximately 7 miles. A thin sheet of ice or sleet will require approximately 100 gals. per mile. A 1250-gal. tank was placed on a truck that was equipped with an underbody scraper. The tank was plastic lined and the distributor pump is driven by power take-off from the transmission.

"Liquid Chemicals For Dust and Ice Control." By Henrik E. Stafseth, Engineer-Manager, Ottawa County, Grand Haven, Mich. PUBLIC WORKS, May, 1958.

Other Articles

"Aerial Oblique Photography For Illustrative Purposes." By H. F. Hilgers, Supervising Designing Engineer, District 15. Texas Highways, March, 1958.

"Most Useful Equipment for County Highway Departments." This is a compilation of some of the data that appeared on the questionnaire that was sent to county engineers and county

The New TENNANT *VACUUMIZED* SWEEPER

Now...a new way to sweep up ALL* the dirt

NO DUST! NO WATER!

You've never seen such clean sweeping as you'll get with the revolutionary new TENNANT *Vacuumized* Sweeper.

Powerful pickup. Cleaning a 7' 4" path and travelling at speeds to 15 mph, this new TENNANT Sweeper instantly picks up practically *all* the dirt. Virtually nothing escapes its powerful broom-and-vacuum system.

No dust, no water. Since there's no dust nuisance where the TENNANT Sweeper is at work, all need for water spray is eliminated.

Works in tight places. Compact design with short 9'2" turning radius lets the TENNANT Sweeper work easily in streets, parking lots, alleys, airports, as well as in congested areas.

For complete specifications and performance data, write G. H. Tennant Co., 755G N. Lilac Drive, Minneapolis 22, Minn.

**Particles as fine as 5 microns (far smaller than the human eye can see) are caught by huge 540 sq. ft. filter.*

TENNANT

VACUUMIZED SWEEPERS

Power Sweepers

Traffic Line Erasers

Concrete Routers

SPECIALIZED MAINTENANCE EQUIPMENT

TYPICAL GUTTER before sweeping. When trying to pick up litter like this, conventional sweepers must spray with water or else kick up clouds of dust that annoy the public. Water, too, is a nuisance, and can't be used in below-freezing temperatures.

ORDINARY SWEEPERS seldom pick up all the dirt. They often leave unsightly litter trails like the one shown above, or mud streaks which soon dry and turn to dust. This is why city officials have long sought a sweeper that would do a cleaner, more efficient job.

NO DIRT HERE! It's been Tennant-swept! The Tennant Sweeper's powerful vacuum-connected brooms get the dirt most sweepers miss. For the first time, your city can now have really clean paved areas—those you can be proud of. No dust clouds, no mud streaks, no water tanks, no hydrant stops.

Get the facts

The new TENNANT *Vacuumized* Sweeper has stirred excitement wherever shown. Its outstanding dust control, maneuverability, and efficiency offer a completely new concept in clean sweeping. If you are interested in raising the cleaning standards of your city, it will pay you to investigate this new *Vacuumized* Sweeper.

highway superintendents throughout the United States. Public Works, May, 1958.

"Two-Way Radio Saves Time and Money For the Public Works Department." Highland Park, Ill., has been using two-way radio for two years and embraces a base station and mobile receivers in 9 vehicles. By Phil Hirsch. Public Works, May, 1958.

"Testing a Bearing Pile." **A 60-ton hydraulic jack was used to test a timber pile** on a county highway bridge. By Maloy Quinn, Clay County Engineer, Clay Center, Kans. Public Works, May, 1958.

"Street Lighting Control." The DC bias system of street lighting control has operated satisfactorily in Tynemouth, but in recent years difficulties have occurred because of low operating voltage, low mains voltage and parasitic voltages due to television sets. Contractors Record and Municipal Engineering, March 26, 1958.

"Control Boards Help The Boss Keep Tab." This board tells the New Jersey highway commissioner at a glance how the construction jobs are progressing. Roads and Streets, April, 1958.

"Some Practical Aspects of **Vibratory Compaction."** Both the contractor and the engineer will find this discussion of fundamentals of value in better understanding how to go about utilizing vibratory compaction. By G. O. Garis, Manager of Research, Bros Inc. Roads and Streets, April, 1958.

"Highway Consultants—Their Work Load is Growing—Their Special Problems are Diverse." Roads and Streets, April, 1958.

"How **Dense Tar Surfacing** is Made and Laid." By E. W. Hinchley, Technical Representative, Midland Tar Distillers Ltd. Municipal Engineering, April 4, 1958.

"100-Ft. **Model Bridge Is Built For Research."** Steel structure, which is actually half-size replica of a 200-ft. double-tracked railroad truss bridge, is one of most powerful test bridges in the nation. It has a hydraulic loading system of 14 150-ton jacks, which are capable of exerting a force of 4,200,000 lbs. Better Roads, March, 1958.

"The Use of **Prestressed Concrete** in Great Britain." Progress in research and practice. The Surveyor, March 15, 1958.

• • •

Cost of Installing Services and Repairing Meters in Toledo

During 1957, 2,035 new water services were installed by the Toledo, O., Division of Water. The 1,908 1-in. services cost $99.26 each; 58 1½-in. services cost $199.02 each; and 47 2-in. services cost $252.36 each.

Also during 1957, 3,325 ⅝-inch meters, classed as "worn out," were repaired at an average cost of $8.28 each; 433 ⅝-in. meters, damaged by hot water, cost $8.48 each for repairs; and 215 frozen ⅝-in. meters cost each $6.84 for repair.

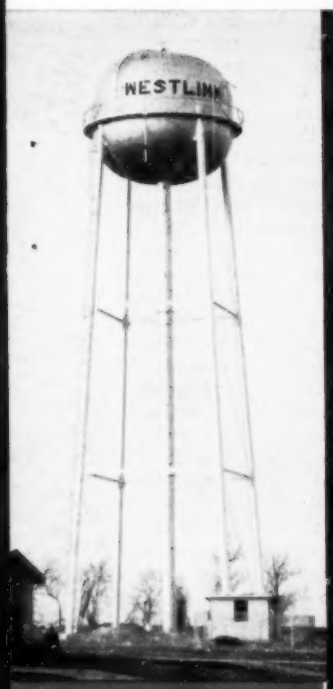
Stopping Leakage Under Flash Boards

To increase storage capacity for the Mount Union Borough Water Works, Mount Union, Pennsylvania, three-foot flash boards are placed in the spillway of the Singers Gap Dam. According to Melvin H. Diven, Superintendent, the boards increase the storage capacity of the dam from 20,500,000 gallons to 25,000,000 gallons. However, it is difficult to prevent leakage between the bottom of the boards and the top of the concrete spillway. "Plastic Elastigum," a product of Barrett Division, Allied Chemical & Dye Corp., has been used to make an effective seal for the crack between the boards and the concrete.

Electronic Computer for City Problems

A small electric computer is being used by New Haven, Conn., to process payrolls, budget accounts, personnel classification records and stores and inventory accounts and records.

KANSAS

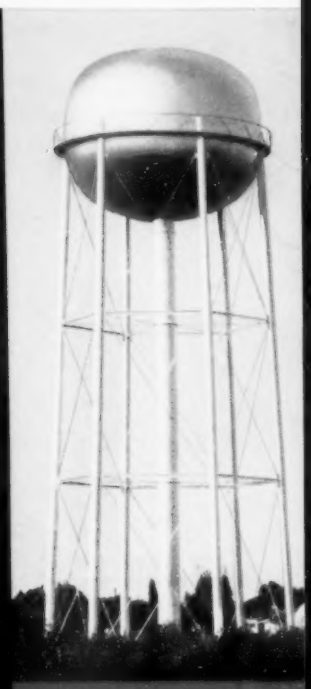


WICHITA
100,000 Gallons
Head Range 21'01"

OLATHE
250,000 Gallons
Head Range 30'10½"

WISCONSIN

RACINE
150,000 Gallons
Head Range 24'9¾"



NEENAH
300,000 Gallons
Head Range 30'09"

Some recent examples of Double Ellipsoidal in the very low head-range range

PDM
ELEVATED STEEL TANKS

The low range of head inherent in all PDM Double Ellipsoidal Elevated Steel Tanks is an advantage emphasized particularly in the capacities from 100,000 to 300,000 gallons.

• As illustrated in the installations above, you get low head range *plus* fine appearance in our Double Ellipsoidal design. Let us detail for you the important *economy* factors, as well.

Pittsburgh-Des Moines Steel Company

Plants at PITTSBURGH, DES MOINES, SANTA CLARA, FRESNO, and CADIZ, SPAIN

Sales Offices at:

PITTSBURGH (25).....3442 Neville Island
NEWARK (2).....1736 Military Park Bldg.
CHICAGO (3)....646 First National Bank Bldg.
EL MONTE, CAL.....P. O. Box 2012
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DALLAS (1).....1247 Praetorian Bldg.
SEATTLE (1).....Suite 350, 500 Wall St.
SANTA CLARA, CAL.....649 Alviso Road
DENVER (2).....323 Railway Exchange Bldg.

Refuse Collection Operations in Winston-Salem

R. W. NEILSON,
Director of Public Works,
Winston-Salem, N. C.

WE ARE now using the following equipment for the collection of household refuse: 13 scow type dump trucks; 19 loadpacker type trucks; and 3 Dempster-Dumpster truck units which service approximately 100 Dempster-Dumpster boxes. Our most recent purchases of packer trucks have been of the mechanical type. We find that this type of equipment gives a very satisfactory service and that it is cheap to maintain and operate. We use three men on the scow type trucks and four men on the packers, including the drivers who also help in picking up the refuse and loading it on the trucks.

Our normal collection schedule provides for two pick-ups during a five-day week. No collections are made on Saturday and Sunday. This schedule applies to the residential sections. Collections are made in the downtown business district each night except on Sunday night. Collections in residential areas are made from the rear of the dwellings.

It will be noted that it takes three days to make the first collection, this first collection being made on Monday, Tuesday and Wednesday. The second collection is made on Thursday and Friday. As would be expected, it takes longer to make the first collection on account of the accumulation of the week-end days of Saturday and Sunday. After the first collection is made during this three-day period the second collection can be made in only two days, since there is less material to be picked up on the second collection. Disposal of household refuse is by the sanitary landfill method. We operate three landfills located at points which will reduce the hauling distance from the collection routes. Our maximum one-way hauling distance is about five miles, with an average hauling distance of approximately three miles.

Normally a truck is assigned a collecting route where the two collections per week are made at each house. On first collection a truck will make about 350 pick-ups, that is, family units. On the second collection on the same route about 500 pick-ups will be made each nine-hour day. As might be expected, the number of pick-ups per day will vary on different routes, since in some residential areas the houses are farther apart and the lots are deeper, thus requiring a longer walking distance to the back yards. Where houses are closer together and where there are multiple family dwellings, more pick-ups are made during the collection day. There are many factors which influence the number of pick-ups per day as well as the number of pounds or tons per unit. Our regulations do not require any separation of garbage and other household refuse, this requirement not being material since the sanitary landfill method of disposal is used.

It has been my observation that within recent years, the character and quantity of household refuse has changed considerably. The advent of oil and natural gas has practically eliminated the need for the collection of ashes. The method of providing frozen foods stuffs has also reduced the number of tin cans in the garbage. Paper cartons and other paper waste have greatly increased. This adds to the bulk or volume of refuse but decreases the unit weight of the material.

You will no doubt agree with the fact that statistics are tricky things and are subject to many factors which have to be taken into consideration when making comparisons. We feel that our method of collection of household refuse could be greatly improved, and we are now making a survey to gather factual information upon which to develop an improved plan of collection. For the purpose of collecting accurate information in the field we now have a young man riding a garbage truck throughout its operation during one five-day week. At this time he gathers the information which we think we need in order to analyze our present system and develop an improved system. It will probably take about a year to gather and tabulate the information we need, after which we hope to make some revision in our routes and changes in our collection system which will give better service than is now being rendered and, we hope, some saving in cost.

Paver Has Correction Course Attachment

● **ADDITIONAL road surface correction abilities for the Blaw-Knox PF-80 are furnished by this correction course attachment, shown in use on an Illinois paving job.**

EXTENSIVE resurfacing of dual lane highways near Bloomington, Ill., necessitated the use of a Blaw - Knox Company - developed correction course attachment with the Bituminous PF-90. This attachment consists of extension arms from the screed back to the rollers which support the screed from the already corrected surface. Payne and Dolan, Inc., a bituminous paving contracting firm of Chicago, employed the attachment for paving work on Routes 150 and 66 where extremely bad road surfaces led the Illinois Highway Department to set particularly exacting paving specifications.

Hydro E-Z Packs cost less to buy, operate, maintain...

Compact Shape uses space to best advantage, permits mounting on smaller trucks, cuts initial cost to a minimum.

Faster Collection and fewer trips to the dump cut man-hours, reduce truck operating costs because load is packed en route.

Simplified Design and accessibility mean lower maintenance costs.

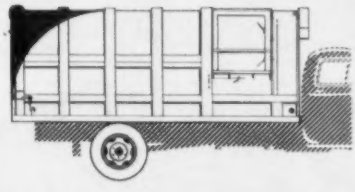
Less Maintenance means less strain on parts because hydraulics do not have to operate continuously resulting in less servicing of truck engine and transmission.

LOOK AT THESE FEATURES:

- Greater Capacity
- Large Openings on both sides and top
- Powerful Compaction
- No-Drip Body
- Simplified Hydraulic System
- Fully Enclosed Load

HYDRO E-Z PACK—THE MODERN DISPOSAL METHOD—*Write Today for Full Details*

Hydro E-Z Pack easily handles bulky objects like this washing machine—compaction method applies up to 76,800 lbs. at 1350 psi of crushing force.



Darkened area shows space increase over conventional models. Compact design permits mounting on shorter body.

Release tailgate, engage the packer—load dumps quickly, completely, safely.

HYDRO E-Z PACK

HYDRO E-Z PACK DIVISION—**HERCULES GALION PRODUCTS, INC.**, GALION, OHIO EZ-358

PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D.
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE SEWERAGE AND REFUSE DIGEST

$10 Million County Project

The booming residential and industrial areas of Birmingham, Ala., and its expanding suburbs have demonstrated that self-imposed sewer service charges can successfully liquidate a $10-million sewage works program to meet the needs of an area containing over 100,000 homes. The county's program of action took the form of three preliminary steps: 1) Preparation of an engineering survey and report on the proposed improvement work; 2) obtaining legislative approval for the issuance of bonds and the establishment of a revenue system for bond retirement; and 3) receiving the approval of the affected electorate for the proposed bond issue. Based on the policy that only those persons who directly receive benefit from the sewer system should be taxed, a sewer service charge based on the volume of water entering the sanitary sewer was selected. Therefore, it was necessary to procure the volume of consumption of each customer from the two water companies serving Birmingham. A board of arbitration was created consisting of five members appointed by the county commissioners. This body acts as an appeal board to review cases in which the sewer service charge is disputed by the sewer user. This county-wide project, originally stagnated by a 0.5-mill tax rate, now yields over $1,000,000 in yearly revenues to properly finance the program.

"How a $10-Million County Project Was Financed by Sewer Service Fees." By R. C. Barton. *Wastes Engineering*, April, 1958.

Metropolitan Denver Sewerage Study

Between 1950 and 1956 the population increased in the Denver region by 156,150 or 27.5 percent. The Inter-County Regional Planning Commission in Denver has forecast a population of 1.5 million for Metropolitan Denver by 1980. Between 1950 and 1956 the Metropolitan Denver population served by sewage treatment works increased from 440,000 to more than 700,000. There are now 32 sewage treatment works in the area. These include six primary plants serving a population of 712,000, including industrial wastes with a population equivalent of over 125,000; six intermediate treatment plants serving 122,590 population, about 2/3 of which is industrial waste; 11 complete plants serving 100,375 population; four oxidation ponds and five community septic tank installations. Only nine of the 32 units are now adequate and with the increased sewage flows expected, overloading is imminent. Metropolitan Denver contains forty-five sanitary authorities responsible for sewage collections as well as treatment. The vast number of separate organizations, which differ greatly in structure, required to administer these sanitary authorities has made coordinated planning among them very difficult. Due to the various factors described in this article, many of the plants in the Denver area are not satisfactorily operated and produce poor effluents. Development plan studies were made for the Clear Creek basin, the Thornton-South Adams County area, and the South-Platte-Big Dry Creek area. When combined with proposals recommended for the City and County of Denver, they form the basis for the Metropolitan Basic Plan. Integration of the various sewage collection and treatment works under a single Authority is considered to be the most feasible solution for the Metropolitan Denver area.

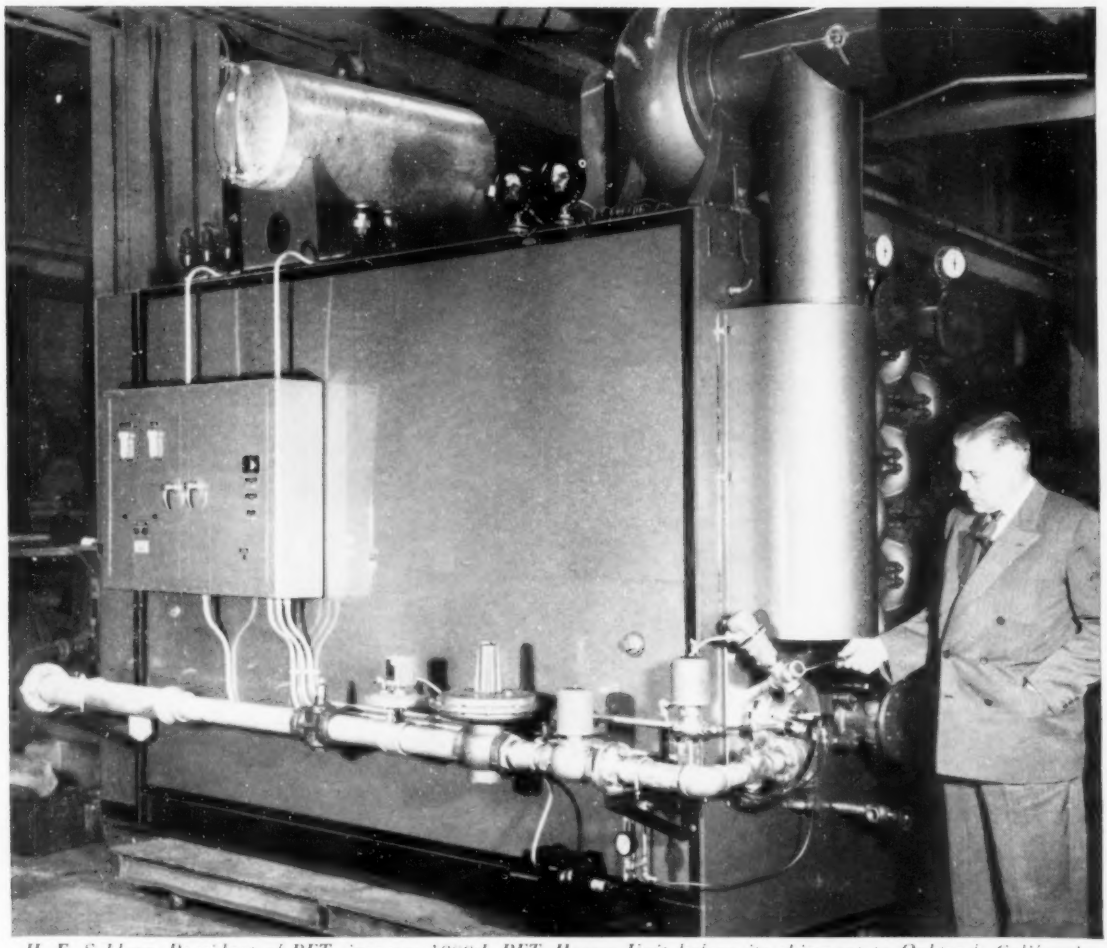
"A Study of Sewerage for Metropolitan Denver." By O. John Schmidt. PUBLIC WORKS, May, 1958.

Sewage Stabilization Pond

A small raw sewage stabilization pond was constructed at Prentiss, Mississippi, and was placed in service in the fall of 1956. The design was along the lines of the Dakota lagoons; that is, with a flat

Landfill Operation Serves Five Communities

SANITARY LANDFILL operations at Highland Park, Illinois, never cease because of inclement weather. The operation, serving five communities with a total population of 60,000 persons, handled 100,834 cu. yds. of refuse plus 176,000 gal. of septic tank waste last year. Two International Drott TD-14 Bullclams and an International Drott TD-9 Skid-Shovel handle all materials despite snow and ice conditions.



H. E. Schlenz, President of PFT, inspects 1000th PFT Heater Unit before its shipment to Oakland, California plant.

PFT's 1000th Heater and Heat Exchanger Unit to be installed in Oakland's East Bay Plant

The flexibility and expandability of PFT equipment is demonstrated again at the East Bay Municipal Utility District Plant which serves Oakland and the Bay area communities.

PFT's No. 1500 Heater and Heat Exchanger Unit (above), the 1000th unit of its kind manufactured by PFT, is now on its way to the East Bay Plant. It is the fourth to be installed.

Originally the East Bay Plant, which was built in 1951, included three 95' diameter digesters all equipped with PFT Floating Covers, three No. 1500 Heaters and Heat Exchanger Units and a complete system of PFT gas control equipment.

The present expansion includes the fourth 95' diameter digester with a PFT Floating Cover and the Digester Heater shown above. For increased efficiency the Floating Cover is equipped with a PFT-Pearth Gas Recirculation System.

Detailed information on PFT Digester Heaters and Heat Exchangers as well as other waste treatment equipment is available on request.

Waste Treatment Equipment
Exclusively since 1893

P.F.T.

PACIFIC FLUSH TANK CO.
4241 Ravenswood Avenue
Chicago 13, Illinois

PORT CHESTER, N. Y. • SAN MATEO, CALIF. • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

bottom and maximum water depth of five feet. At Prentiss, however, a design loading of 35 pounds of 5-day BOD per acre was used, whereas the Dakota design criterion is one-half that amount. The Prentiss pond is rectangular in shape with a surface area of approximately one acre. The cast iron inlet pipe is supported on piers, and terminates at the center of the pond. The outlet, 100 ft. from the inlet, consists of a square concrete manhole, about eight feet from the water's edge, which is fitted with a tee. A valved drain permits fluctuating the water level. During the two test runs made BOD of the raw sewage was 204 and 245 mg/L and of the effluent 52 and 35 mg/L. Coliform removal was high—96.96 to 99.99 percent. Suspended solids removal was 16.3 percent in February and 96.6 percent in May. The low costs of construction and maintenance of stablization ponds are attractive to the small and medium size Mississippi towns. Per capita construction costs range from $28.76 for the one-acre Prentiss pond to $10.28 per capita for a 15-acre pond in Houston, Mississippi. Neither of these costs include pumping station or land costs.

"Sewage Flow Characteristics and Treatment Methods for a Small Community." By Robert A. Gerber. PUBLIC WORKS, May, 1958.

Detroit Educates Citizens

An educational - enforcement technique achieves the objective of proper household storage of garbage and disposal in the Automobile City. A summary of the facts learned from the campaign to make Detroit a cleaner and healthier city are: 1) Citizen cooperation is essential in carrying out an administrative program for community improvement. In order to achieve this, education and enforcement must go hand in hand. 2) Notices and other printed material do achieve results but the material should be concise and well illustrated. 3) Personal contact by trained employees is extremely important. 4) All city departments involved must be aware of the role and responsibility of each in the planned program. In 1952 the mayor appointed a Sanitation Committee consisting of the Health Commissioner, the Public Works Commissioner, City Controller, Chief Smoke Abatement Inspector, Senior Police Inspector, Chief Sanitary Engineer and several others. An early result of sincere cooperation by committee members was the transfer of enforcement

REX VERTI-FLO® CLARIFIER solves plant overload problem

Rex Verti-Flo Clarifier in Gastonia, N.C., sewage treatment plant. Walter Gardner, plant chemist.

With the aid of Rex Verti-Flo Clarifiers, the city of Gastonia, North Carolina, substantially increased the capacity of its sewage treatment plant *without increasing the plant size*... solved the problem of a badly overloaded plant. Installed in the existing settling tanks, Verti-Flo provided the increased capacity needed...at low cost. Here's why!

Rex Verti-Flo Clarifier divides the conventional horizontal-flow settling basin into a series of individual vertical-flow cells. Through a unique combination of wood partitioning baffles and adjustable V-notched weirs entirely around the periphery of each cell, tank capacity is tremendously increased. Installed in existing tanks, Rex Verti-Flo Clarifier will at least *double the present capacity*...and provide a far clearer effluent.

The adjustable weirs control the draw-off within each cell so that full advantage is taken of the generous weir length. Inlet, distribution, vertical and weir velocities are extremely low and carefully controlled ...assuring most suitable settling conditions. There is no short-circuiting between cells and flow is completely balanced throughout the tank and among the cells.

If you have an overload problem in your plant or want to assure maximum capacity for a new plant, investigate the advantages of Rex Verti-Flo Clarifier.

For complete details, write CHAIN Belt Company, 4722 W. Greenfield Ave., Milwaukee 1, Wisconsin.

CHAIN BELT

duties pertaining to waste receptacles from the 33-man sanitary police detail to a new 18-man section authorized in the Health Department. The committee pinpointed the 55-gallon oil drum as the most common and troublesome illegal waste receptacle and a plan was developed for removal of all of them. For the first trial program, the Sanitation Committee selected an area containing 392 blocks and 12,000 homes in which the success of the program could be visually demonstrated. Success in this area would help in futhering the program in the rest of the city. About 87% of the householders promptly procured the two portable galvanized containers of 20 to 26-gallon capacity, and either a proper burning basket or a third container, as illustrated in the notice forms. Warning-type notices were issued to the most flagrant violators, and of these, again about 87% complied without court action. The "educational-enforcement approach", enabled Detroit with only a small staff to modify the habits of about a million people in a little more than one year.

"Detroit Educates Citizens to Improve Sanitation." By John H. Ruskin and Hugh G. Blanding. *The American City*, April, 1958.

Remodeled Sewerage System

Glen Cove, N.Y., a Long Island City of 20,000 persons, by increasing the capacity of its sewage plant and adding secondary treatment, has removed a major source of pollution from the natural waters of Hempstead Harbor. New additions included a grit chamber, a lift station, two primary clarifiers, two trickling filters, and a new digester. Other work included the conversion of the existing settling tanks into secondary clarifiers, the addition of pumps, chlorinators and control equipment, the rewiring of the sludge filter building and equipment, and general modernization of existing buildings and facilities. The renovation and enlargement project cost approximately $860,000 and was financed principally through a 30-year, $856,000 general obligation bond issue. The automatic equipment and enlarged plant reduces harbor pollution, increases purifying efficiency, and lowers maintenance costs.

"Remodeled Sewerage System Accomplishes Three Objectives." By Harland N. Phillips. *The American City*, April, 1958.

Nitrification Effects on BOD

Oxidation of ammonia nitrogen to nitrite or nitrate has been demonstrated to be a cause of serious errors in certain BOD measurements. In the usual 5-day BOD on sewage, industrial wastes, or pure organic compounds, nitrification does not occur until after the seventh day of incubation. Nitrification does, however, cause serious errors in BOD measurements on secondary effluents from sewage treatment plants. The following are four methods of eliminating nitrification error from BOD tests which have been investigated: 1) Maintenance of a constant BOD:N ratio, leaving no excess oxidizable nitrogen other than necessary for growth of the heterotrophic organisms; 2) pasteurization of seed material to kill or inhibit the autotrophic nitrifying organisms; 3) measurement of increased NO_2- and NO_3-N content during incubation and subtraction of nitrogenous oxygen demand from observed BOD values; and 4) substitution of a completely oxidized nitrogen source in the BOD dilution water. On the basis of the results obtained from these investigations, it is concluded that the first three pro-

SPECIFY VITRIFIED CLAY BLOCKS

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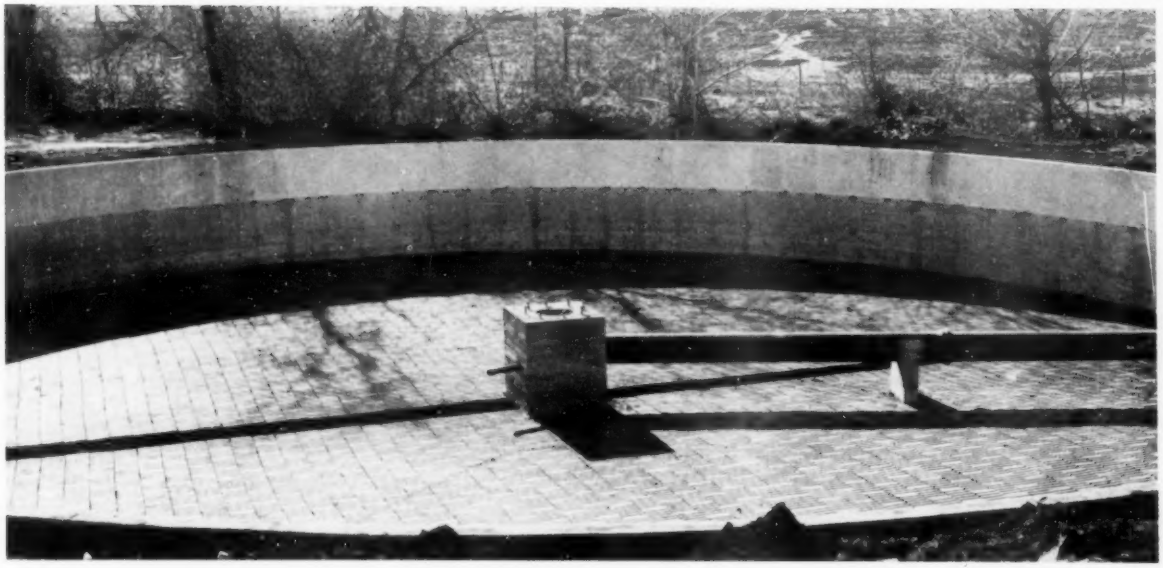
Tearing up a filter bottom a few years later to replace failed blocks made of substitute materials is no fun. Neither is it necessary. Get them right the first time by specifying vitrified clay underdrain blocks.

ASTM Specifications C 159-55, with TFFI members' 50-year guarantee of their vitrified clay blocks, are your assurance of permanence and satisfaction. Made in modern plants under modern manufacturing controls usually impossible with blocks made of substitute materials, vitrified clay affords permanent protection against acids, alkalis, and bacterial actions.



Trickling Filters' Great Advantages

Include low initial cost, low operating costs, flexibility and adaptability, simple easy operation, long life—longer than that of bonds issued to pay for them, top-notch effluent, and overloading no problem.

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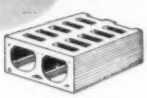

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cedures are either unreliable or impractical for one reason or another. Preliminary investigations have shown that results obtained by substitution of nitrate in BOD dilution water are: a) Supply of a satisfactory nitrogen source for the growth of organisms oxidizing the lower fatty acids, oxalic acid, and carboxymethylcellulose; and b) prevention of nitrification up to a period of at least 20 days, therefore allowing for direct BOD measurements including only carbonaceous oxygen demand.

"Oxygen Demand Measurement Errors in Pure Organic Compounds —Nitrification Studies." By P. E. Gaffney and H. Heukelekian. *Sewage and Industrial Wastes*, April.

Stabilization Ponds

The design and operation of stabilization ponds strictly as wastewater treatment devices has been developed in the field largely on an empirical basis. With the addition of a certain degree of laboratory control and a detailed statistical analysis of field data, a basis for design and operation has been developed and reported. The results of four years of experimental investigations employing laboratory models and outdoor pilot plants are reported in this article. Laboratory experimentation was conducted under various environmental conditions. Both natural and synthetic substrates were employed as influent wastes. The effects of hydraulic phenomena such as recirculation and turbulent mixing were studied in relation to BOD loading and detention time. The results indicate that waste stabilization ponds may be designed and operated so as to accomplish all of the functions provided by conventional sewage treatment plants. With adequate operational control, BOD loadings may be much higher than those currently being applied in practice, especially in the warmer areas.

"Waste Stabilization Ponds. I—Experimental Investigations." By E. R. Hermann and E. F. Gloyna, *Sewage and Industrial Wastes*, April, 1958.

Other Articles

"Waste Treatment **Plant Serves Highway Restaurant.**" Public Works, May, 1958.

"**Sewer Use Regulations** by Municipal Ordinance." Problems and considerations in the preparation of equitable controls for sewage and industrial waste. By Don E. Bloodgood. Water and Sewage Works, April, 1958.

"Effective Operating Methods for the **Vacuum Filtration** and Drying of Sludge." Part 4 of a Supplementary Series on Getting the Best Performance From Your Sewage Works. By Leroy W. Van Kleeck. Wastes Engineering, April, 1958.

"Organization and Equipment For **Sewer Maintenance**" in Chicago, Illinois. By T. S. Ford and Frank J. O'Donnell. Public Works, May, 1958.

"Redox Potentials in Waste Treatment—Laboratory Experiences and Applications." A report of some conclusions which have drawn regarding **redox potentials in anaerobic waste treatment.** By Werner N. Grune and Chun-Fei Chueh. Sewage and Industrial Wastes, April, 1958.

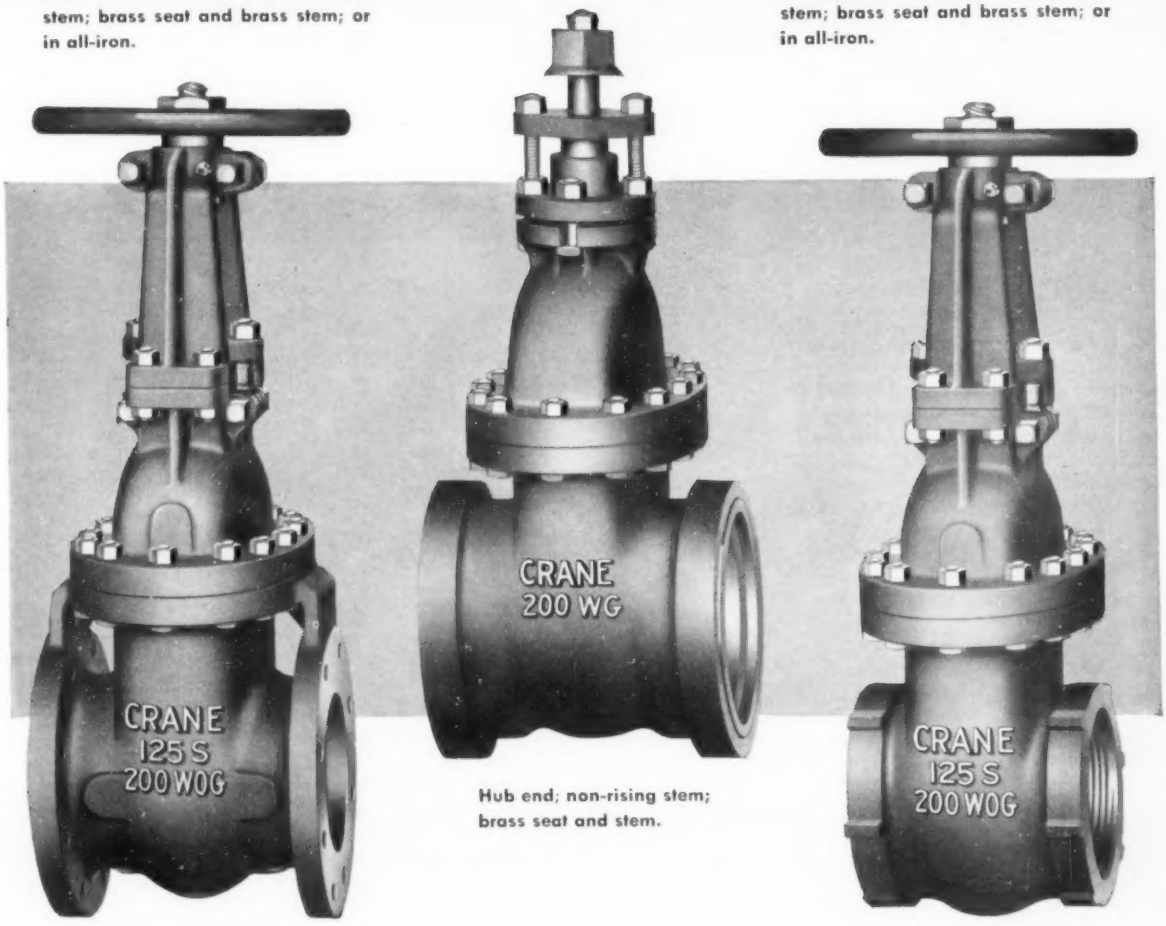
• • •

Design of the Charlotte Sewage Treatment Plants

In our May issue, page 139, opposite pictures of the Charlotte, N. C., sewage treatment plants, it was noted that these plants were originally designed by W. M. Platt. Actually, the engineers on construction, J. N. Pease & Co., Charlotte, designed the later phases of the work, including the trickling filters illustrated on page 138 of the May issue and previously described in PUBLIC WORKS.

Flanged end; outside screw and yoke. Available with brass seat and steel stem; brass seat and brass stem; or in all-iron.

Screwed end; outside screw and yoke. Available with brass seat and steel stem; brass seat and brass stem; or in all-iron.



Hub end; non-rising stem; brass seat and stem.

Crane Iron Body Gates–Versatile Valves for Water and Sewage Services

Look to Crane for better performing 125-pound iron body wedge gate valves. Improved design gives them greater strength and important operational advantages. As a result, these valves offer dependable performance on a wide variety of services . . . easy maintenance . . . long life.

Among the advantages of Crane iron body wedge gates are:

- *Oval body and bonnet*, with extra metal where needed most.
- *No bonnet joint leakage*—More bonnet bolts on closer centers insure uniform bolt load distribution on bonnet joint and gasket.
- *Long disc guides* seat discs properly . . . minimize drag on seating surfaces . . . prolong valve life.
- *Shoulder-type seat rings* prevent rings from loosening in service.
- *Two-piece ball-type gland* prevents binding on stem even when gland bolt nuts are pulled up unevenly.
- *Exceptionally deep stuffing box* can easily be repacked under pressure when valves are wide open.
- *Available in 19 sizes*—2 inches to 48 inches—all-iron or brass trimmed. In addition, Crane makes companion valves in globe, angle, check, quick-opening and Underwriters' patterns.

For complete descriptions of Crane iron body gate valves, consult your Crane Representative, or write to Crane Co. at the address shown below.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

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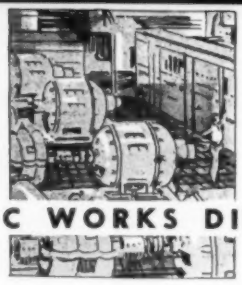


PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE WATER WORKS DIGEST

Modern Well Digger

Although development of ground water is still the chief interest of the modern well drilling organization, the methods used in finding water and developing it are vastly more complicated, more accurate, more successful and longer lasting than they were even 20 years ago. Therefore, their concern is engaged in other avenues of endeavor. It is not unusual for the modern well drilling organization to be engaged in the water treatment business. Some may have allied themselves with water treatment people; others have developed their own interests in the field. The Layne organization, for instance, is now manufacturing and installing its own treatment equipment, just as it has deep well turbine pumps for many years. It also has a complete field treatment department for field analysis, pilot plant operation, and plant installation. Quite frequently the water supply contractor will enter into a general contract to make a test survey, develop a test well, test for quality and/or quantity, put a pilot treatment plant at the test well site and, by various test runs, come up with the best way to treat the particular water for the particular purpose for which it will be used. This usually involves iron and/or manganese removal, dispersal of gases, corrosion control, and sometimes softening or demineralization.

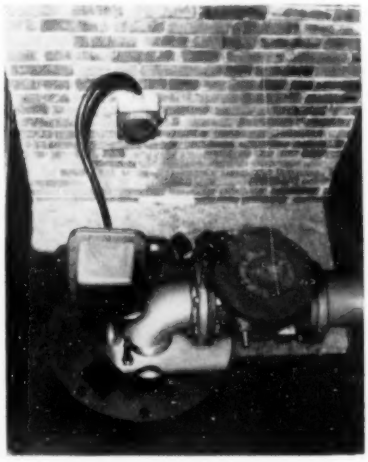
"Modern Well Driller." By Oliver C. Lewis. *Water & Sewage Works*, April, 1958.

Polyelectrolytes As Coagulant Aids

In spite of the fact that production of polyelectrolytes for use in water treatment has been developed by several companies in the past 3 or 4 years, very little has been reported in the literature on the use of these compounds. One exception is a paper by Johnson who concluded that "polyelectrolyte coagulants showed such promising results in the systems studied that they could become an important supplement to coagulants now used in clarifying waters". The generic term polyelectrolyte describes a variety of organic compounds, such as starch and starch derivatives, cellulose compounds, polysaccharide gums, and proteinaceous materials which may be used as coagulant adjuncts. In spite of their varied sources, these compounds may be collectively described as biocolloids, which are naturally occurring polymers carrying electric charges of ionizable sites. This article is a report of research undertaken at the Robert A. Taft Sanitary Engineering Center to determine the utility of some commercial polyelectrolytes in coagulation of surface waters and of laboratory-prepared turbid waters. The work was divided into three phases using: 1) a synthetic anionic polyelectrolyte; 2) a synthetic cationic polyelectrolyte; and 3) a natural polyelectrolyte. The data presented in this paper clearly demonstrate that polyelectrolytes are effective coagulant aids which may prove useful in some water treatment plants. However, it becomes very difficult to generalize on the behavior of these aids. Several of the benefits which may be obtained are explained in detail together with some of the precautions which must be observed. No attempt was made in these studies to determine the

SUBMERSIBLE PUMPS ELIMINATE ABOVE-GROUND STRUCTURES

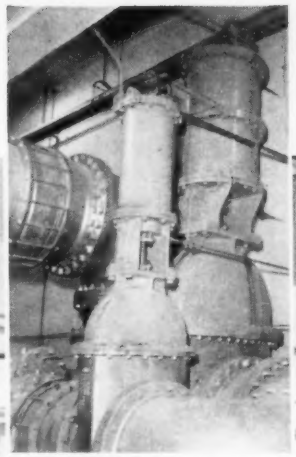
TO PROTECT residents from the sight of pumphouse buildings, and from possible noise and vibration, Owensboro, Kentucky, used Byron Jackson submersible type pumps. Six deep wells were drilled in residential streets, and a 20 HP submersible pump-motor unit was installed in each well. The pumps were housed in understreet pump units, easily accessible through ordinary manhole covers. Well seals made the units flood, weather and vandal proof. Starters and automatic control systems were mounted on adjacent telephone poles. The pumps are controlled by means of telephone wires from a remote panel located in the Owensboro Municipal Utilities Building. Since the pump installations lie under city streets, no pump houses or other elevated structures are necessary and the sealed pump units are entirely silent and vibrationless in operation. The BJ pump operates completely submerged at any depth, with no adjustments or routine maintenance required. It is easily adapted to lowering water tables by addition of riser pipe and cable at the surface end. Since the oil-filled motor



is close-coupled to the pump, the entire unit operates efficiently even in crooked wells.

Elmer Smith is Superintendent of the Owensboro Municipal Utilities Department, which provides both water and power for the city. Consulting engineer for the project was Black & Veatch of Kansas City, Mo. The Resident Engineer was Floyd Smith.

40 IOWA GATE VALVES...



IOWA *hydraulic gate valves in the filter plant gallery.*

IOWA *motor-operated gate valves installed in the main pump station of North Texas Municipal Water District. (General Manager: Mr. A. P. Rollins; Consulting Engineers: Forrest and Cotton; Design Engineer: Mr. Ormond A. Stone.)*

Control delivery of
20 million gallons of water a day
for the North Texas Municipal Water District

• Forty IOWA Hydraulic and Motor-operated Gate Valves—from 4" to 30" sizes—are used in the Filter Gallery and High Lift Pump Station of the North Texas Municipal Water District, supplying 10 North Texas Municipalities and the District's largest customer, the City of Dallas. Additional IOWA gate valves are used in the six pumping plants operated by the district.

The Filter Plant, located at Wylie, Texas, has a capacity of 20 million gallons a day. However, the design is such that it can operate safely at twice this amount. Water is delivered to the ten member municipalities and the City of Dallas through 90 miles of transmission line, ranging from 12 to 42 inches in diameter.

This Texas application is typical of the ability of IOWA to furnish gate valves to meet the most exacting specifications for plant and distribution service. Be sure and check the wide variety of IOWA valves, accessories and specialties before you place your order.

Let us send you details on Iowa's complete line of valves and hydrants

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cost of treating water with polyelectrolytes, as a cost analysis becomes an individual consideration dependent upon the characteristics of the water and the type and amount of polyelectrolyte required. The question of toxicity of these compounds has been one of the deterrents to their wider acceptance and use. The PHS has a technical advisory committee on coagulant aids for water treatment, whose primary function is to review all aspects of toxicity concerning the use of polyelectrolytes in municipal water supplies. This Committee has issued its first report, which approves certain coagulant aids listed in the Journal.

"Natural and Synthetic Polyelectrolytes as Coagulant Aids." *Jour. A.W.W.A.*, April, 1958.

Six Keys to Successful Financing

There are six keys to successful water works financing. It is difficult to list these "keys" in order of importance because they are interrelated and so dependent upon each other that actual appraisal in any given order of value may be meaningless. The six key factors are 1) rates; 2) management; 3) public relations; 4) employee relations; 5) physical plant records; and 6) maintenance. Rates for water service must be realistic—adequate to meet all operating and maintenance expenses, support an adequate depreciation fund, meet all interest charges, amortize outstanding indebtedness, cover immediately proposed financing and provide a surplus to take care of emergencies and engineering studies. Management can be completely effective only if it is divorced from politics. It should be operated as any efficient business. All forms of communications must be used to explain costs, problems and procedures to the customer, for only through better understanding can a reasonable and favorable reaction be obtained. The importance of good employee relations cannot be overemphasized. An employee's understanding of management problems is a solid step toward good public relations. In addition to a property record, every utility should have a complete set of maps, records and layouts of source of supply, treatment plant and pumping station. Needless to say good maintenance is of real value to the operations of a water utility, whether financing is imminent or not.

"Six Keys to Successful Financing of Municipal and Private Water Utilities." By Frank Amsbary. *Water Works Engineering*, April, 1958.

Filters

Basic filter parts include: the outside container, the bed of filter medium and the distribution and collection systems to provide a uniform flow through all parts of the bed. Flow rates average 2 to 3 gallons per minute per sq. ft. of bed area.

Filter beds are cleaned periodically by reversing the flow and increasing it to about 10 to 20 gpm per sq. ft. (backwashing). This lifts and swirls the sand, loosening the dirt and flushing it to waste.

Rotary surface washers with high-velocity water jets may be used to help break up the layer of dirt on top of the bed.

After backwashing, the first water through the filter (rinse water) also picks up some dirt and is run to waste.

A "multiport valve" replaces 5 individual valves and reduces the number of valve manipulations for cleaning a filter from 10 to 3. It also indicates the cycle in progress and ensures proper sequence. Operation can be made completely automatic with hydraulically- or motor-operated valves controlled by meters, timers and float switches.

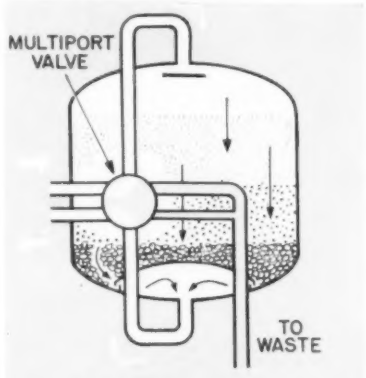
SAND FILTERS for removing dirt, precipitates, suspended solids

Sand filters simply "strain" the water as it flows downward through the filter bed. It is probably the oldest and most widely used method of water treatment.

Gravity filters. Practically all large public water-supply plants include a series of gravity filters made of concrete for permanence and low maintenance cost. Sizes run up to 400 or 500 sq. ft. for each filter.

Chief difference among concrete gravity filters is the method of water collection under the filter bed. The false bottom system provides uniform collection but requires about 2 ft. extra filter height and is highest in cost. Header-lateral collection systems of steel pipe are lowest in cost but do not provide perfectly uniform collection and can corrode. There are also patented systems such as Permutit's *Monocrete*® system which uses collapsible forms for casting lateral ducts in the concrete itself. *Monocrete* ducts are oversize for uniform collection and are corrosion-free since no metal is used. The cost is less than for false-bottom construction.

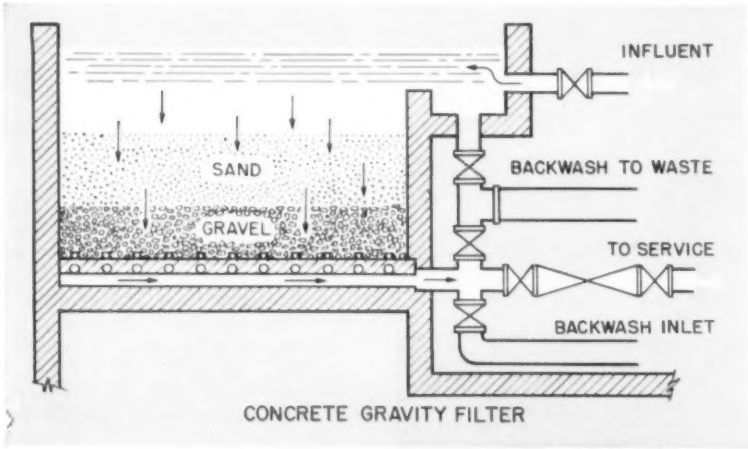
Steel-tank gravity filters cost less than concrete in small and medium sizes and are generally used in industrial plants. Wood-tank filters have low maintenance cost, but they are not practical for large sizes and not as attractive as painted metal. They are now used primarily where there is a metal shortage.



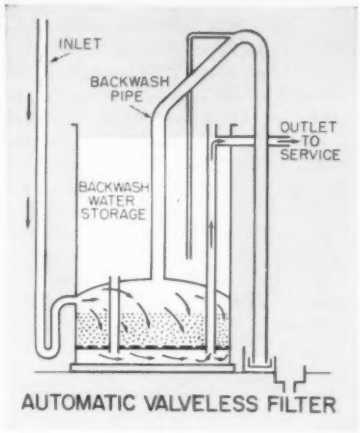
PRESSURE FILTER

Pressure filters deliver an effluent under pressure, usually under 100 psi, to eliminate repumping. Since no water depth is required over the bed to provide pressure, these filters are smaller and lower in cost than gravity filters of the same capacity.

Vertical pressure filters are available to 12 ft. diam. with approx. 113 sq. ft. of bed area. Horizontal pressure filters provide large filter-bed areas, up to 200 sq. ft., at lowest tank cost but may not maintain as uniform bed conditions as vertical type.



CONCRETE GRAVITY FILTER



AUTOMATIC VALVELESS FILTER

Automatic Valveless Filters (gravity type) are a new Permutit development. They greatly reduce filter cost because they use no valves or flow controllers. They provide completely automatic, foolproof self-operation yet actually cost less than conventional manually-operated gravity filters. Sizes up to 12' diam. available.

When the suspended matter removed by the filter bed causes the pressure loss to reach a predetermined figure, backwashing starts automatically. At end of backwash, flow reverses automatically, and the backwash storage compartment is then filled with a brief rinse plus filtered water. Filtered water then passes to service through a separate outlet.

FILTER MEDIA for removing oil, bad tastes, odors, etc.

Graded anthracite coal. Used in place of sand to minimize pick-up of silica following hot-process softening of boiler feedwater or for removal of oil from steam condensate.

Activated Carbon (Carbo-Dur®). Absorbs excess chlorine and dissolved elements caused by decayed vegetation or algae that affect taste and odor. Carbon filters or "purifiers" are backwashed to remove suspended matter picked up by the filter.

Calcium Carbonate (Neutralite) raises the pH of low-pH, corrosive water at the same time that it filters.

Manganese zeolite oxidizes and removes moderate amounts of iron and manganese, also hydrogen sulphide, chief cause of "rotten egg" odor and sulphur taste. It is regenerated with potassium permanganate.

For information on filters or other water-conditioning equipment, write: The Permutit Company, Dept. PW-6, 330 West 42nd Street, New York 36, N.Y. or Permutit Company of Canada, Ltd., Toronto 1, Ont.

Grand Rapids Modernizes

In 1955 Grand Rapids inaugurated studies to determine the status of the water distribution system and filtration plant, with recommendations on the measures to be taken. Under this program no steps were taken to augment the water supply as the program was essentially one of improving existing water filtration, water distribution and electric power facilities. The main supply is from Lake Michigan. Water is pumped from the Lake to the filtration plant at Grand Rapids through a 46-inch pipe line with a peak capacity of 59 mgd. Water is also available from the Grand River, but it is of poorer quality. In June, 1955, water filtration facilities consisted of two adjacent plants; the South Plant erected in 1911 and the North Plant erected in 1921. The plants were identical and had a combined capacity of 44 mgd. Work on the South Plant was begun first. All of the baffles in the mixing and grit basins were removed and the basins converted into two parallel flocculation basins and were provided with rapid mix chambers and equipped with top entering mixers. Two existing baffled settling basins were converted into a single basin and all baffles removed. The modernization of the North Plant was essentially the same as for the South Plant. Improvements were made in the chemical feed handling equipment, the filtration plant and the pumping facilities. The main pumping station was completely rebuilt hydraulically and electrically. The distribution system modernization program provided: 1) A completely modern main pumping station; 2) reduced main pumping station pressures resulting in lower water main maintenance; 3) greatly reduced main pumping station operating and maintenance costs; 4) good water pressure and volume in elevated areas of the city; 5) greater pumping capacity; and 6) better control of water pressures throughout the city.

"Grand Rapids Modernizes Water Treatment, Pumping and Distribution." By Edward A. Schewe. PUBLIC WORKS, May, 1958.

Wichita's Water Works Financing

The citizens of the City of Wichita, Kansas, voted favorably on a special referendum involving one of the largest revenue bond issues ever contemplated for any water works in the United States. This financing program was inaugurated to pay the cost of constructing and extending the water supply and treatment facilities, which have been owned and operated by the City of Wichita since 1940, and to pay for the acquisition of the water works distribution system and water works property of the Wichita Water Company. The present expansion program, now substantially complete, includes the enlargement of the water filtration plant to a capacity of 84 mgd; the construction of a second large transmission line to deliver water from the Equus Beds to the treatment plant and 20 additional Equus Bed wells. This second transmission line is 66 inches in diameter and approximately 22.5 miles long. The treatment of the water from the Equus Beds includes aeration, chemical flocculation, settling, filtration, and chlorination. Treatment includes iron and manganese removal, as well as reducing carbonate hardness from 200 ppm to 86 ppm. The key to the success of the city water works and its financing has been the adequacy of the rates that produce sufficient revenues whereby the city is able to discharge its operating requirements to

its customers and its financial requirements to its bond holders. With the help of a group of Wichita investment firms and competent lawyers, the city passed an ordinance authorizing the issuance of the $41,825,000 in water works revenue bonds. Incorporated in this ordinance were a number of important points, which specified how the revenues should be dispensed to insure the payment of interest and repayment of debt in an orderly and business-like fashion. Many of its important features that may be of interest are enumerated in this article.

$41,825,000 Bond Issue Sold to Buy Private Utility and Improve System." By A. P. Learned. *Water Works Engineering*, April, 1958.

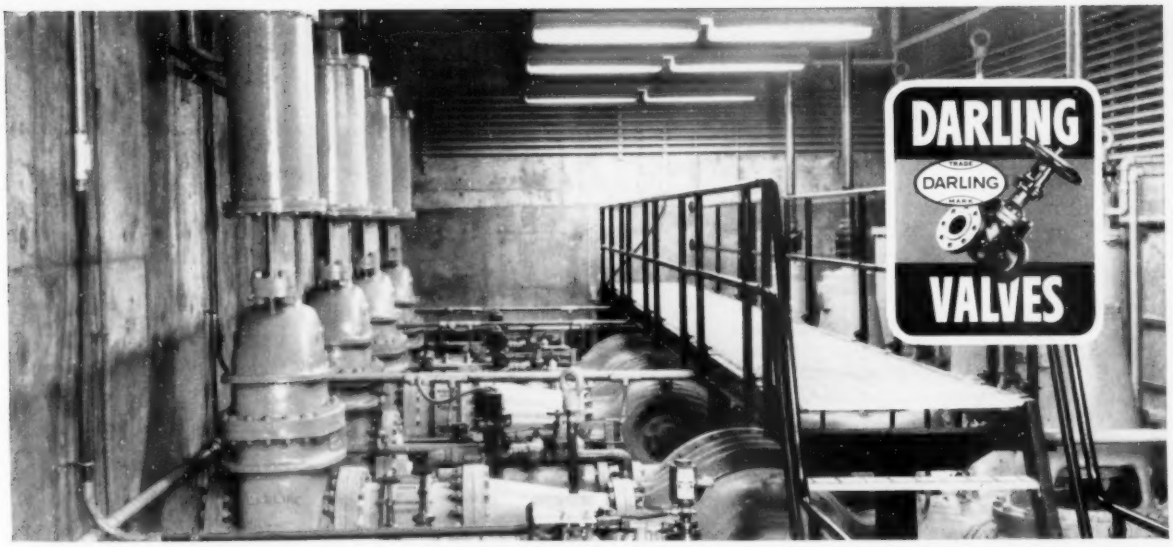
Planning Pays Dividends

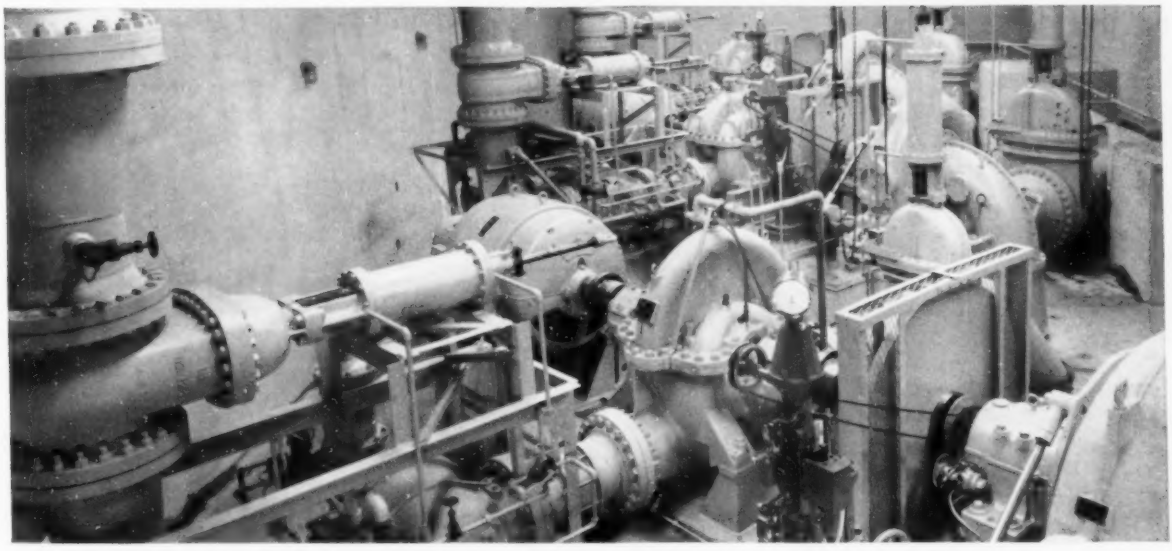
The Dallas metropolitan area has shown a 50 percent population increase each decade over the previous decade with the exception of the economic depressions of 1890 and 1930. Shortly before World War II it was evident that steps must be taken to plan additional water supply reservoirs for the city and its growth, and surveys were begun on feasible sites. All of these plans, however, were interrupted by the War and it was not until 1945, when materials and manpower were available, that the Federal Government reinstituted its flood control studies on the upper Elm Fork River and that active planning and financing were begun on this enlargement. The Corps of Engineers in their planning saw that with a scarcity of desirable sites a dual-purpose reservoir was essential. The two present reservoirs have impounded in flood and conservation storage as much as 506 bg of water with a safe combined yield of 136 mgd. It is already apparent that the safe yield of Dallas' reservoirs is being rapidly approached due to the continued growth of the city and suburban areas which Dallas will serve. As a matter of fact, Dallas has built more linear feet of water mains since the end of the war than in the entire history of the city since its beginning in 1890, amounting to some 1291 miles of water mains, an average of about 100 miles per year. Dallas at present has two major filtration plants. The Bachman plant has been increased in size twice and is now rated at 100 mgd maximum. The Elm Fork filter plant is being reconstructed and it is estimated that a maximum of 150 mgd can be produced from this facility. Present plans call for immediate construction of additional storage reservoirs with estimated storage of 200 mg and the future planning and construction of more storage reservoirs to meet the estimated requirements to the year 2,000. Dallas is ahead in its water supply now and intends to stay ahead.

"Planning Pays Dividends—if followed by action." By Henry J. Graeser. *Water & Sewage Works*, April, 1958.

Odor Control with Residual Copper

Control of earthy, musty odors that had characterized the Los Angeles aqueduct water supply for many years was first accomplished in 1950. It was one of several secondary benefits of treatment with residual copper. The primary purpose of the residual-copper treatment had been to control copper-sensitive pond weeds and reduce plankton population in the water. It had been found by previous experience that a relatively low, constant, copper residual was more toxic to these submerged growths than were intermittent heavy treat-





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ments. The copper residual was maintained in the water by a constant-feed copper sulfate solution tank, from which a saturated copper sulfate solution was regulated to give a predetermined copper concentration in the water. The copper sulfate residual in Dry Canyon was kept at 0.8-0.9 mg/L (approximately 0.2 mg/L copper) for the first three months, and then adjusted to 0.6 mg/L (0.15 mg/L copper) for the rest of the 1950 season. As the copper residual built up in the reservoirs, the earthy musty odors in the water disappeared. Experience has shown that copper and the usual chlorination procedures have little effect on these odors. It was assumed, therefore, that the copper residual was toxic to some odor-producing mechanism in the reservoir. *Streptomyces* satisfies several of the requirements of earthy, musty odor-producing agents in water. These experiences and laboratory findings are compatible with recent findings on the toxicity of copper to bacteria. The treatment has been continued for the past 7 years with gratifying results.

"Control of Earthy, Musty Odors in Water by Treatment with Residual Copper." By Kent A. Bartholomew. *Jour. A.W.W.A.*, April, 1958.

Other Articles

"Water Supply for Municipal Service." Some of the problems of local water supply and their solutions are presented in this condensation of a talk given before the Statewide Water Conference of the Illinois State Chamber of Commerce, Water Resources Committee by John H. Murdock, Jr., Water & Sewage Works, April, 1958.

"Porous Plate Filter Bottoms." This report on experiences includes some detail on design, installation and materials in order to simplify the task of engineers in adapting porous plate filter bottoms to plant designs and specifications. By Frank C. Roe. Water & Sewage Works, April, 1958.

"Yield of **Impounding Reservoirs.**" Several approaches to the problem of determining the safe yield of impounded water supplies have been gathered together for comparison. By Everett L. MacLean. Water & Sewage Works, April, 1958.

"How to Keep Your **Credit Rating** High and Assure Low Interest Rates." Bond rating authorities give advice on how investors judge quality of water works revenue and general obligation bonds. By D. M. Ellinwood and R. C. Riehle. Water Works Engineering, April, 1958.

"Water Construction Expenditures Have Doubled in Past Ten Years." National sampling survey for 1949-1958 supports past reports and forecasts of annual increases in water works investment. Water Works Engineering, April, 1958.

"Atlanta Grows **Where Water Goes."** Capital expenditures of $17,625,000, over a 6-year period, improve water service and reduce insurance rates by $1,000,000 yearly. By Paul Weir. Water Works Engineering, April, 1958.

"Water Works Switches **Power Source"** in $2.5 million rehabilitation project, Grand Rapids. By S. G. Ferris. The American City, April, 1958.

"Waste Treatment **Plant Serves Highway Restaurant."** Public Works, May, 1958.

"Toxicologic Methods for Establishing **Drinking Water Standards."** Attention is drawn to a rather large background of toxicologic information and practical health safety limits, now used in other fields, that may be advantageously used in the development of drinking water standards. By H. E. Stokinger and R. L. Woodward, SEC, USPHS, JAWWA, April.

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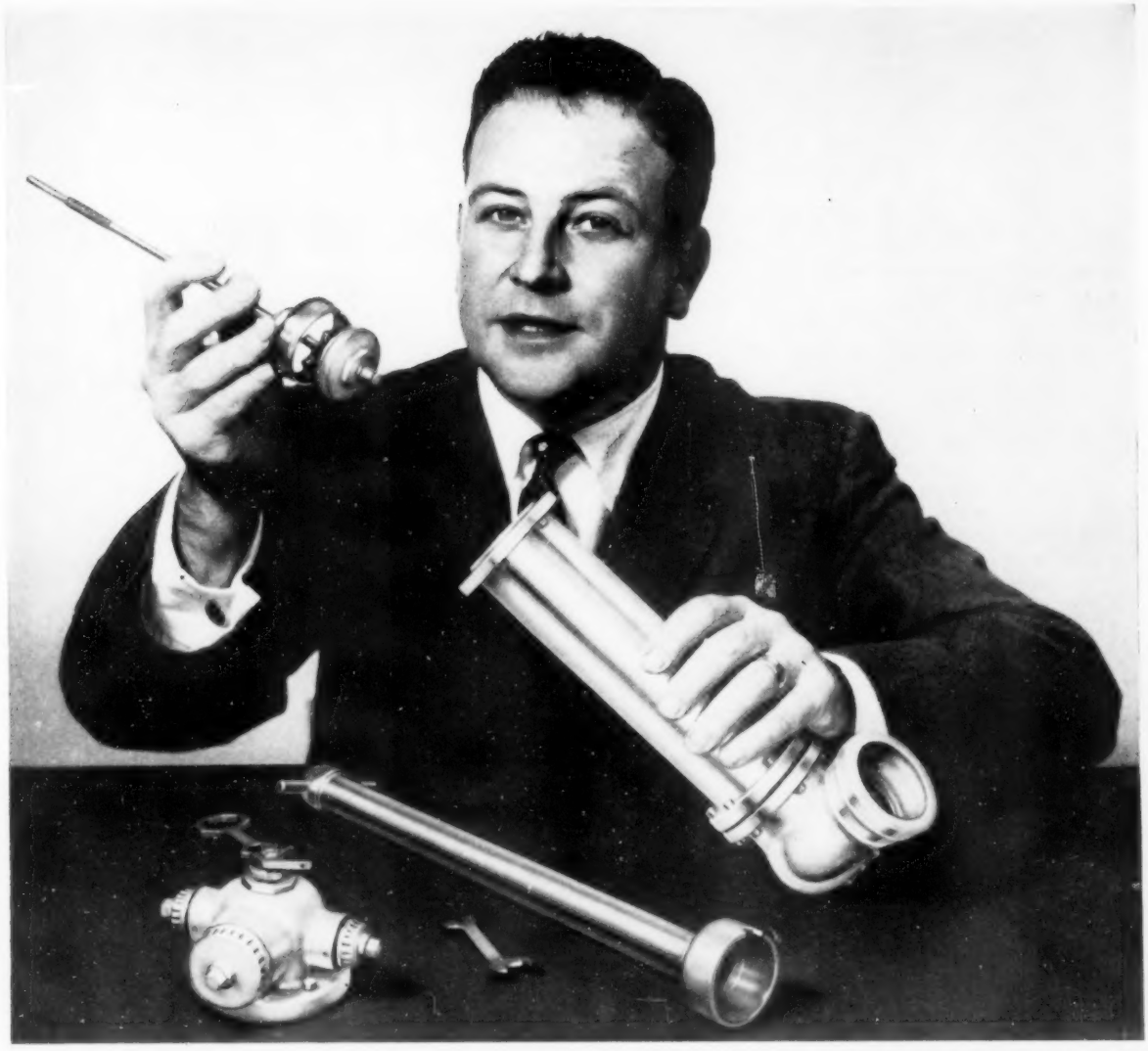

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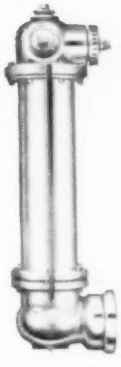

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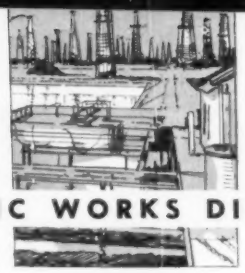


PUBLIC WORKS DIGESTS

Prepared by
CLAYTON H. BILLINGS
Associate Editor

THE INDUSTRIAL WASTE DIGEST

Whey Waste Oxidation

At one time it was believed that anaerobic treatment constituted the only practical method of reducing whey wastes from cheese factories. Previous work by the authors had shown that aerobic biochemical oxidation of whey can be successful. The purpose of this laboratory study was to compare rates of whey removal with and without nitrogen supplements. The treatment consisted of aeration in the presence of a sludge prepared from skim milk solids and an active aerobic culture obtained from an industrial dairy waste disposal unit. The sludge concentration in the mixed liquor was 2000 ppm, and daily additions of 1000 ppm whey were made, as determined by the COD test. Nitrogen was added in the form of ammonium hydroxide, resulting in a COD to nitrogen ratio of 30 to 1, as compared to 50 to 1 in the unsupplemented whey. Samples were collected on the 1st, 21st, and 96th days after whey feeding commenced to determine whether the sludges were retaining their whey purifying abilities. It was concluded that oxidation was unaffected by the addition of nitrogen. Also, while a change occurred in the characteristics of the sludge on prolonged aeration, the whey removal ability was not changed.

"Aeration of Whey Wastes, I. Nitrogen Supplementation and Sludge Oxidation." By Lenore Jasewicz and Nandor Porges. *Sewage and Industrial Wastes*, April, 1958.

New Indicator For Industrial Waste Alkalinity

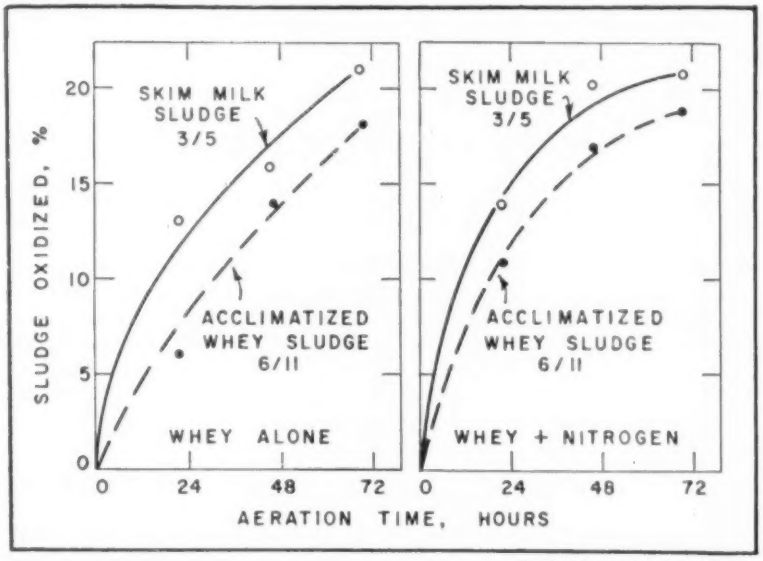
Because industrial wastes are often colored, difficulty has been experienced in determining the alkalinity of wastes or waste-sewage mixtures by the methyl orange or brom cresol green—methyl red titrations recommended by "Standard Methods." After experimentation with a number of mixed indicators, one was found to produce a striking color change at pH 4.2, visible through all types of industrial wastes encountered. The color change consists of deep green through deep gray to a distinct red. The indicator composition is methyl orange, indigo carmine, and methyl red.

"Substitute Indicator Found for Methyl Orange in Sewage-Wastes Analysis." By A. S. Goldberg, Passaic Valley Sewerage Commissioners. *Wastes Engineering*, April.

County Plans Plant To Serve Industry

In order to provide sanitary sewers in an area of Orange Co., Florida, under development by the Glenn F. Martin Co. for the manufacture of missiles and electronic control systems, a sanitary district was created. Authority for formation of the district is an enabling state statute which empowers counties to establish and operate sanitary districts, to levy assessments upon benefitted property, and to issue revenue or general obligation bonds to finance works. The Martin Company agreed to donate a 30-acre treatment plant site and to pretreat industrial waste. The processes contributing waste would include plating, etching, and paint spraying, with a total waste and sewage flow of 0.75 to 0.80 mgd. Pretreatment of the waste would include neutralization of cyanides, dilution of chrome wastes with sanitary sewage to a concentration less than 1.0 ppm, correction of pH, and dilution of non-toxic dissolved sodium and calcium salts. Concentrated nitrates would be recovered from batch-treating spent solutions. The treatment plant for the District was designed to include a Barminutor, primary sedimentation, high - rate trickling filters, secondary sedimentation, separate sludge digestion, chlorination, and sewage lagoons. As a protective measure, a pH recorder and alarm was installed in the effluent trough of the primary clarifier to assure operating pH levels of 7.0 to 8.5. Details of financing the plant and all arrangements regarding construction of the plant were not worked out until February, 1957. The target date for completion was November 7, 1957.

"From Concept to Completion in One Year." By W. W. Gillespie and J. M. Colyer. *Wastes Engineering*, April, 1958.



Courtesy Sewage & Industrial Wastes

● **RATE of aerobic digestion of sludge immediately after feeding cheese whey.**

Smog Potentiality Of Leaded Fuels

Because automobile exhaust gas has been implicated as a major source of smog-producing chemicals, an investigation was made to evaluate the possible effect of tetraethyllead and halogen scavengers used in antiknock fuels. Among the possible effects of lead and associated products are: 1) catalysis of gaseous reactions to alter chemical composition of impurities in air, 2) a synergistic effect on the chemicals that cause eye irritation, 3) adsorption by lead-containing particulate matter of eye-irritating gases so that such irritants would be released in the eye in larger quantities than with unleaded fuels. Reaction chambers were built from greenhouses, large enough to permit access of personnel for measurement of eye irritation. Test fuels were burned in an automobile, with the exhaust piped into the reaction chambers. The fuels included two antiknock fuels and one without antiknock additives. Eye irritation and odor, oxidant production, and carbon monoxide, aldehyde, nitrogen oxide, and hydrocarbon production were measured. No significant difference was detected in the exhaust products and effects of the three fuels.

"Smog Chamber Studies of Unleaded vs. Leaded Fuels." By F. V. Morriss, Calvin Balze, and J. T. Goodwin, Jr., Midwest Research Institute. *Industrial and Engineering Chemistry*, April, 1958.

Admission of Wastes to Sewers

In drafting ordinances for control of the discharge of industrial wastes to sewers, municipalities should classify wastes, indicating those requiring no treatment, those to be treated, those requiring limitation as to flow only, and those to be kept out of the sewers. Before a building permit is issued to an industry, the industry should be required to submit data concerning the wastes it is proposed to discharge, to provide a sample, and to state anticipated daily and monthly discharge volumes. It is unreasonable for municipalities to exclude all wastes from sewers, and legislating against specific industries might constitute discrimination. The ordinance should require that permission should be obtained from a designated official before a waste is discharged and should spell out the procedure for adequate pretreatment. Specific limits for objectionable characteristics should be indicated. Equitable charges need be established, based on characteristics and volume. There is no authority in the State of Washington for a Local Improvement District assessing an industry the cost of treating a waste based on volume and characteristics, but these can form the basis for a service charge.

"City Control of Industrial Wastes in Municipal Sewers." By E. H. Campbell, University of Washington. *Sewage and Industrial Wastes*, April 1958.

Waste Heat Disposal

A problem not too well recognized is that of the waste heat discharged into streams. Extreme thermal loads have caused temperatures of 120°F. or more in a few streams. Studies by the Ohio River Valley Water Sanitation Commission have shown that temperatures in Raccoon Creek receiving no thermal load, closely correspond to air temperatures. In the Mahoning River, receiving a high thermal load, the water-air temperature differential has varied between 20 and 60°F. The Ohio River, which receives waste heat amounting to 10^{12} Btu daily, appears to be coping with the problem sat-

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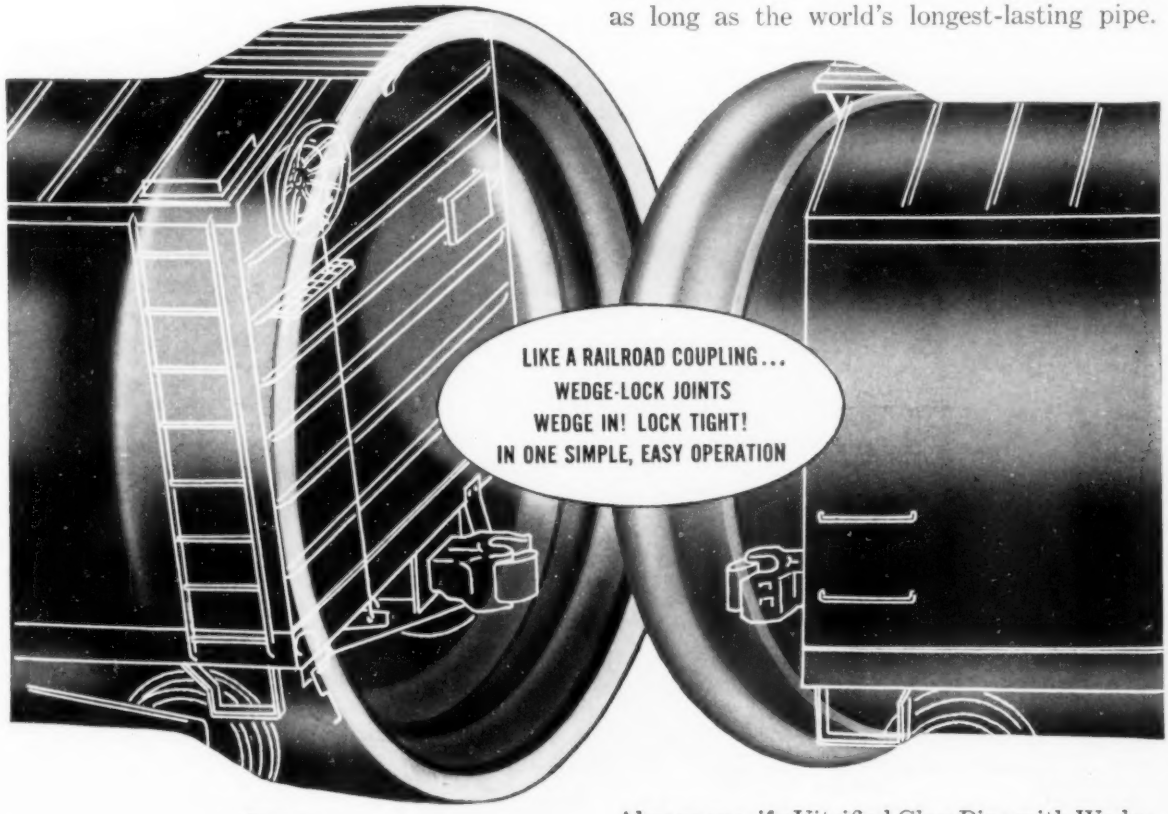

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The Stillwater Clay Products Company, Cleveland 16, Ohio

WLC-158-31

isfactorily, indicating that streams are capable of recovery without damage. One effect of thermal pollution is a decrease in viscosity contributing to thermal stratification in pools and reservoirs. This means that mixing is inadequate and a pollution load may penetrate further downstream than is intended. Another factor is that the dissolved oxygen concentration of water at solubility equilibrium is halved with an increase in temperature from 0°C to 35°C, making available less oxygen for overcoming organic pollution. The rate of BOD exertion is increased by temperature, which might have an influence on the rate of degradation of a stream. Recent studies, however, indicate that deoxygenation and reaeration rates are equally affected by temperature. Consequently, one of the bad effects of thermal pollution may not be as serious as originally believed. Control measures available include dilution, the construction of reservoirs to provide increased flow during summer months, and such water conservation methods as the use of cooling towers, spray ponds, and recirculation systems whereby heat is dissipated to the air.

"Thermal 'Pollution' of Streams." By Edward W. Moore. *Industrial and Engineering Chemistry*, April, 1958.

Other Articles

"Kinetic Studies of **Formation of Atmospheric Oxidants.**" By B. E. Saltzman. Calculations based on inorganic reactions suggest that only a small fraction of oxidant may be ozone and that during smog peaks, "nitric oxide" indicated on recorders may be free radical-nitric oxide complexes. Industrial and Engineering Chemistry, April, 1958.

"Two Major Industries **Cut Their Wastes Pollution Problems** by Self-Analysis." By Frank Reid. In-plant investigations of wastes result in simplification of treatment problems at Dupont and General Electric sites. Wastes Engineering, April, 1958.

"**Ion Exchange** in the Treatment of Trade Wastes." By T. V. Arden. While only a limited number of trade effluents are suitable for solution by ion exchange techniques, it is hoped that greater experience with them in the future will broaden the scope in application. The Surveyor, March 22, 1958.

"1957 Industrial **Wastes Forum.**" A transcript of the forum held at the 1957 Federation of Sewage and Industrial Wastes Association meeting involves a complete discussion of the various aspects of the problem of pollution from cooling tower blowdown. Sewage and Industrial Wastes, April, 1958.

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AASHO Road Test

Construction has been resumed at the AASHO Road Test at Ottawa, Illinois. The $22-million highway research project will test widely-varied thicknesses of pavement under truck axle loads ranging from 2000 to 30,000 pounds on single axles and 24,000 to 48,000 on tandem axles.

The test facility—six loops containing 836 separate test sections—will be completed and ready for traffic in the late summer of 1958. The test sections will have nearly 200 different combinations of thicknesses of surfacing and underlying layers of material. Traffic will run in 10 lanes in five test loops about 18 hours a day, six days a week for two years. A complex system of instruments, many developed specifically for the project, will help measure and record the effects of the traffic on the pavements.

The project is sponsored by AASHO and administered by the Highway Research Board of the National Academy of Sciences—National Research Council.

Millions of pieces of data on pavement behavior under repetitive

loading will be accumulated during the two-year test period. Final results are expected to be valuable to highway engineers and administrators, legislative bodies and vehicle manufacturers.

Construction of the test facility is being directed by the Illinois Division of Highways with a special task force under the supervision of W. E. Chastain, Sr., engineer of physical research. Heading the Highway Research Board staff for the project is W. B. McKendrick, Jr., former chief engineer of the Delaware State Highway Department. William N. Carey, Jr., former executive assistant to the director of the Highway Research Board, is chief engineer for research.

FEDERAL AID FOR STREETS AND URBAN ROADS

A Paper by James J. Sullivan, Superintendent of Streets and City Engineer of Springfield, Mass., at the Annual Meeting of the ARBA.

IN OUR community, Federal Aid for urban public roads and streets as of this moment is conspicuous by its absence. From my talks with other officials with similar positions and responsibilities, I find that this same lack appears in every community. There are millions of dollars for Interstate and Rural Highway construction, but there is no money for urban construction within the city limits. The Department of Streets and Engineering is the public works agency for the City of Springfield. Our departmental public works budget averages over $5,000,000 each year. Like many communities, we have been told that we are eligible to receive extensive Federal Aid for many urban projects. We have urban redevelopment programs, have Public Housing Programs, and are now told that we will receive considerable Federal funds for Interstate Highway construction. We are in accord with all of these programs and intend to take full advantage of them. However, in reviewing the proposed Federal financing it appears that the normal everyday problem of street and highway construction within the urban area is being neglected.

It is this phase of the highway work program that places the largest burden on the taxpaying public. Of what benefit to a community is a broad new arterial highway or expressway if the secondary road system serving this highway or expressway has been neglected to a point where it is obsolete and even dangerous. Local funds are not sufficient to keep up with the problem, and we become hopelessly bogged down in a new maze of traffic problems and additional construction costs for which no funds are readily available. Our only hope for a solution to this problem is to secure Federal assistance to go hand-in-hand with new construction of the proposed primary system.

There are certain obstacles which now prevent the use of currently appropriated Federal funds for this work. Some of these obstacles are technical in nature, including designing, right-of-way acquisition and insufficient planning for small communities. This insufficient planning is not necessarily caused by neglect on the part of the small community but rather is caused when a large interstate project

hopelessly enmeshes a smaller community in a tangle of traffic channelled onto existing roads which were never designed to carry such a load. Such communities need help and need it at once.

Similar problems are encountered by the medium sized cities where one or more Interstate Highways converge and double the normal traffic problems of the community. City Engineering Departments are not always made fully cognizant of the plans previously prepared at State or Federal level and sufficient time is not always accorded the community to alter the normal planned growth of the city to accommodate the new system. These are some of the technical problems involved; they can be corrected or overcome; but the larger problem which is not technical, but financial, presents an increasing dilemma to the officials who must be financially responsible for our community operations. More direct presentation of our requirements to those who can furnish the financial assistance to correct this situation is needed.

The causes of the problems which we all face do not lie solely in the lap of the Federal Bureau of Public Roads. Many of them directly involve the individual State Highway Departments. Some are caused by a difference in political beliefs between the communities and the State administration. Some are caused by the fact that the State Highway Department urgently needs the money for a pressing problem in some other community. Most of them are caused by the lack of proper representation. The average small community has little knowledge of the amount of Federal funds to which it might be entitled for urban construction, and it is seldom able to make its wants known to the proper agencies.

Whichever of these causes concern your community, the result is becoming all too well known. When we ask where our Federal Urban Funds are forthcoming, we are invariably told that our program did not qualify, or we learn that there is no current Federal Aid program under consideration which includes our community. This seems to be the rule rather than the exception. Our only hope to correct this situation is to get our problem closer to the financial source of supply which is the Federal Bureau of Public Roads.

Proper Planning Needed

Most normal communities with proper planning, a share of Federal

Aid and some extra financial effort on the part of themselves could maintain a satisfactory secondary road net-work. To do this, however, we must have active participation both in the financial development of the Federal Aid Program, and the allocation of construction funds. There are two ways in which the desired result could be obtained by municipalities.

The first would be to have a Federal Municipal Aid Committee established by the ARBA, and empowered to seek legislation whereby the needs of the cities and towns can be more fairly and equitably presented to and considered by the Bureau of Public Roads. This Committee should be a sectional committee and meet with the purpose of having the various districts of the Bureau of Public Roads empowered to consider direct applications from cities and towns and to set upon these applications in the same manner in which primary Federal Aid approval is given to State Highway Departments. We realize that much additional work and detail will be required in the districts, but we believe our problem to be of sufficient magnitude to insist upon some such representation.

If existing Federal laws prohibit direct presentation of projects by cities and towns, then the specifications of the Bureau of Public Roads for approval of Federal Aid allocations to the various State Highway Departments should require that not less than twice each year every State Highway Department shall give a hearing to individual cities and towns for the purpose of allowing each city and town to present a planned program for Federal assistance on urban projects within the community; and that once each year, the State Highway Department shall report to the individual cities and towns the amount of Federal Aid allocated to each community for such projects and the disposition of the work already approved. The State Highway Department should be further required to include whatever assistance they might render in furnishing engineering studies, planning media and available technical data on proposed Interstate Highway projects pertinent to the area or any other similar technical assistance the State Highway Department could provide to the smaller community.

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Swimming Pool Chlorination

(*Continued from page* 88)

Continuous chlorination is the preferred method for all installations, irrespective of the disinfectant forms; experience indicates that far better bacteriological conditions can be maintained than with intermittent chlorination. Intermittent chlorination as practiced generally is considered makeshift and applicable only at small and private pools.

Safe Handling of Chlorine

The hazard of accidental escape of chlorine gas incident to its use for disinfection of public swimming pools is recognized by the Joint Committee. Briefly, minimum safety precautions recommended refer to: location of chlorine and dispensing equipment, including provision for air eduction, mechanical ventilation, and cylinder anchorage; ability of equipment to withstand reasonable wear and tear; and availability of gas masks for emergency use.

From a review of the various Joint Committee recommendations, it is apparent that increasing attention is being given to the potential hazards of using chlorine gas, particularly at indoor pools, and to the advisability of having minimum safety recommendations for the safe handling and use of liquid chlorine at

swimming pools. Further, recognition is being given to the elimination of the gas hazard where hypochlorite solutions are used.

Though cognizance is taken of the potential hazard attending the use of liquid in installations where large numbers of persons are gathered in relatively confined and congested areas (e.g., at or near a public building), the Committee makes no recommendation restricting the use of liquid chlorine for such purposes.

At least 18 states have no regulatory safety provisions (or recommendations) relative to the use of chlorine gas at public swimming pools. Of the remaining states, 12 have provisions implied in accordance with the Joint Committee recommendations; 18 require or recommend a separate enclosure for chlorinators; 11 ask for some type of forced ventilation; 16 more states require forced ventilation in below-grade installations only; and 12 require the provision of gas masks. It is readily apparent that a serious deficiency exists in this regard. This is especially pertinent in view of the considerable number of accidents that have occurred at swimming pools due to escaping chlorine, and because no state is known to regulate against the use of chlorine gas at either indoor or outdoor pools.

Regulation Changes Needed

The considerable variation in disinfection practice in this country demonstrates a need for uniform recommendations as to type and amount of chlorine residuals to be maintained, to include consideration of the relationship of pH both to efficacy of disinfection and physiological effects. It appears that the recommendations of the various states do not adequately reflect the importance of frequent chlorine residual determination, especially in view of the practical significance of this in lieu of frequent bacteriological testing at most pools. There is relatively little recognition given by state codes or recommendations to the hazards of accidental escape of chlorine gas into public buildings, to the accidents involving chlorine gas and to the relatively safer use of hypochlorites for indoor installations. Though some cognizance is being taken of high free residual chlorination, the benefits suggested by this practice appear to merit its further consideration. The limitations of chlorine-ammonia treatment, as well as those of intermittent disinfection operation, are fairly well established.

Waste Stabilization Ponds *In South Dakota*

DON C. KALDA,
Chief, Water Pollution Control Section, Division of Sanitary Engineering, South Dakota Department of Health, Pierre, South Dakota

This article is based on a paper presented by Mr. Kalda at the Thirty-Ninth Texas Water and Sewage Works Association Short School.

THE TERMINOLOGY applied to the treatment devices under consideration vary in different areas of the country. The broad term of *waste stabilization pond* has received rather general acceptance in South Dakota. A more specific term often applied to municipal installations is *sewage stabilization pond* or simply *stabilization pond*. The terms *oxidation pond, stabilization lagoon*, and *sewage lagoon* are also often used.

Stabilization ponds are operating in all sections of South Dakota, ranging from the sparsely populated western area to the more densely populated agricultural eastern area. For the smaller installations, the aggregate cost of construction and operation of stabilization ponds in high value land areas has generally been found to be less than that of conventional treatment methods. The final choice of treatment method should be reached by a thorough study of local conditions and economic considerations.

Some application of stabilization ponds as a complete or secondary treatment device for industrial wastes has been made in South Dakota. A small meat packing plant has used a stabilization pond successfully for over two years. The pond is located within 200 feet of a trailer camp and no nuisance conditions have developed. Waste stabilization ponds applied to treatment of milk wastes appear to be a solution to a particularly difficult treatment problem.

Operation and Performance

The mechanism of waste treatment in stabilization ponds depends largely on the interactions of bacteria and algae. Bacteria convert the decomposable organic matter to more stable products and in so doing liberate nutrient elements necessary for algae growth. The algae utilize these abundant nutrient materials and through photosynthesis produce the surplus oxygen required for aerobic bacterial action.

During the extended periods of ice and snow cover in the northern areas, the aerobic processes are replaced by anaerobic action. A complete ice cover prevents the escape of odors associated with the anaerobic processes. The transitional period from ice to open water is the most critical time of the year for release of odors.

The degree of treatment obtained in stabilization ponds is considered to be equivalent to that obtained from well operated conventional secondary treatment plants. From the standpoint of the pollutional load discharged to a watercourse, it is significant to calculate organic reductions in pounds rather than in concentration. Losses in liquid volume through seepage and evaporation markedly reduce the organic load discharged. Studies in North and South Dakota show that the average minimum reduction in BOD concentration was 70 percent which occurred during ice cover. Maximum reductions in BOD concentration approached 99 percent. Reductions in coliform density were found to be 99 percent or over more than 50 percent of the time and, with few exceptions, were 95 percent or more at all times.

These reductions can be obtained from a single cell installation with due consideration given to organic and hydraulic loadings. Additional cells to operate in series with the primary cell are generally not considered necessary in South Dakota unless an unusually high priority water use exists downstream or a completely withholding installation is desired.

● **STABILIZATION pond at Beresford, S. D. One surface acre of area is usually provided per 100 population equivalent. Liquid depth is variable, from 3 to 5 ft.**

Design Criteria

Suggested minimum standards for stabilization ponds were first developed in South Dakota in 1953, and on the basis of experience and performance, were revised in 1955. The suggested criteria apply particularly to the smaller installations although the general design features would be similar in most respects for large installations.

The basic consideration in the design of stabilization ponds is the organic loading that can be applied to satisfy all conditions. Such conditions are considered to encompass two main objectives in South Dakota; that is, (1) to provide an adequate degree of waste treatment, and (2) to provide such treatment without creating nuisance conditions.

Experience with the early installations in our state has indicated that providing one surface acre per 100 population equivalent (15 to 20 pounds BOD) will satisfy both of the above conditions. The surface loading is based on a liquid depth of three to five feet. Such a recommended loading is considerably more conservative than that suggested by some of the other states. Loadings have been held low not particularly for increasing treatment efficiency but to prevent occurrence of nuisance conditions. The lack of odors has become an important factor in the rapidly increasing use of stabilization ponds in South Dakota.

Climatic conditions are necessarily an important consideration in design in our area. Ice cover normally exists from December 1 to March 15. With the loadings recommended, recovery is rapid following ice breakup, resulting in only brief periods when odors might occur. The more heavily loaded ponds require increasingly longer periods to revert to the acrobic state. Although presently available data are inconclusive, it appears that a high sulfate content in the water supply is conducive to more serious odors, and this effect would necessarily be more pronounced in the heavily loaded ponds. Many of the municipal water supplies in our state have sulfate contents of over 1000 mg/l.

The choice between use of a single cell or multiple cells depends on local conditions, downstream water uses, size of the installation, and other general considerations. Should it be considered necessary to provide one or more cells in series with the primary cell, it is definitely recommended that the loading on the primary cell not exceed the recommended values previously enumerated (15 to 20 pounds BOD per surface acre). Loading based on surface area with controlled depth is considered to be the significant basis for design. Should it be desirable to reduce the size of the primary unit, smaller cells operating in parallel are recommended. Such a design has distinct advantages in many instances.

The distances suggested in our standards with respect to habitation and the municipality now serve primarily as a guide, and strict adherence is not considered warranted. The results of a recent court action in South Dakota regarding the location of a proposed stabilization pond installation may be of interest. It was proposed that a portion of a pond would be located within 500 feet of a residence, and the owner

brought suit to prevent construction of the installation. After hearing testimony for two days, the court ruled against the property owner.

Cost data on a number of installations are available. There are 19 stabilization pond installations serving cities with populations from 367 to 2871. Construction costs of these average $15.92 per capita. Average land costs for those installations where data are given represent an expenditure of $4.67 per capita. The average cost of providing sewage stabilization ponds in the municipalities represented in the listing was $20.59 per capita.

Operational Problems

The only serious operational problem occurred at the original installation serving Kadoka, South Dakota. The pond produced severe odors at times, especially during the summer season when ordinarily stabilization ponds perform at peak efficiency. Investigations resulted in no specific conclusions on the cause of the odors, but several contributing factors were apparently involved. Heavy tourist traffic contributed a significantly increased organic load during the summer season. Other possible contributing factors include (1) the irregular shape of the pond; (2) obstructed wind sweep across the pond; (3) undesirable inlet; and (4) high sulfate content of the municipal water supply. A second cell was constructed in early 1956 to provide a loading of approximately one surface acre per 100 population equivalent based on the summer tourist load. The installation has functioned without nuisance conditions since that time.

No other serious nuisance conditions have been noted. Many of the more heavily loaded ponds recover rather slowly in the spring but have caused no serious problems. Alternate freezing and thawing further aggravates the recovery process. No initial filling with liquid other than the normal waste discharges has been found necessary. Ponds have been placed into operation in early winter with no difficulties experienced. Insect breeding in properly constructed and maintaining ponds is not a problem.

PARKING REQUIREMENTS
FOR PROPOSED STATE OFFICE BUILDINGS

Seven new state office buildings near the present State House in downtown Trenton have been proposed in a report of a special legislative commission to meet the central housing needs of the New Jersey state government for the next 25 years. A part of the report, consisting of a comprehensive analysis of office needs and site recommendations, was prepared by the commission's planning consultants, Frank Grad & Sons, architects and engineers of Newark, N. J. The Grad analysis shows the need for a total of 1,388,000 square feet of space in all seven buildings, based on an anticipated 6,839 employees in the 11 departments to be housed by 1983, and 800,000 square feet of garage or parking space.

To estimate required parking facilities, it was necessary to establish a ratio betwen number of employees and number of vehicles parked. During interviews with the various departments it was found that on the average 50 percent of the em-

ployees held parking permits at the present time. It was further revealed that a greater number of permits is presently issued than there are parking spaces. This appears to be practical because existing Parking Field No. 5 is rather remote from State office buildings and although many employees request permits, the actual use factor in the field is only one to three. It is the belief of State personnel in charge of parking facilities that requests for parking permits would be very high, in fact approaching the 100 percent level, in the event parking facilities were provided immediately adjacent to proposed new buildings and that the use factor would also be high.

On the other hand experience in commercial office building construction indicates that provision of parking space for all employees is completely impractical from an economic standpoint. Since Trenton has a good public transit system that apparently could be readily extended to any concentration of new State buildings it is believed no hardship would be caused employees if the number of parking spaces were held to a level consistent with normal commercial practice. It may be noted also that the advantages of an office location in or near the center of city compensates employees for the lack of the parking facilities that might be available in a suburban location. It should be taken into account that the John Fitch Way Redevelopment Project, site of five of the proposed buildings, includes proposals for the construction of extensive middle income housing which conceivably could find favor with State employees and would be within walking distance of any State building placed in the area.

For the purposes of the architect's report it was necessary to assume a certain ratio of parking spaces to employees and it was concluded that at a maximum this should be one space to each three employees. For the 6,800 employees expected by 1983 some 2,270 spaces thus would be required. Based on an allowance of 350 square feet per car, a total area of 800,000 square feet of garage or parking space would be needed. If, in the ultimate development, the State decides the ratio of parking space of employees is too low the increased area requirement would have to be met by use of multi-tier parking garages. During the initial stages of the program adequate space would be available for an increased ratio if land were acquired by the State for its ultimate needs.

New Developments in Bituminous Paving Equipment

(*Continued from page* 136)

ation and several batches of a different gradation be required, one hydraulic control lever will disengage the automatic controls, permitting manual operation of the various cycles. On completion of the batches of off-standard mix, the control will return the operations to fully automatic operations of the original gradation.

Bituminous Pavers

A new crawler model paver is equipped with an electric vibrating screed which operates at 3,600 vibrations per minute. It is claimed that this feature permits higher operating speeds because of the reduced tendency to create voids or "pull" the mat. The transmission has 15 paving speeds varying from 11 to 102 fpm and a maximum travel speed of 2.2 mph. This unit is reported to have operated at speeds up to 58 fpm on binder courses.

Several years ago a pneumatic-tired paver was placed on the market. Some of the advantages claimed are low maintenance and repair costs, longer wheel base, and higher travel speeds. This original model is capable of paving widths from 8 to 13 feet at speeds up to 60 fpm. A similar model in the development stage employs greater automation, including automatic load equalizing and laydown speeds up to 120 fpm.

If paver manufacturers can prove that end result requirements for bituminous concrete pavements can be met at higher laydown speeds, the related work flow process, including mixing and hauling, must be studied to discover how the paver output can be matched. In the way of further improvements in paver design, it has been suggested that an automatic screed positioning device similar to that described for motor graders might be adapted to bituminous pavers.

Paving contractors and highway departments having a large mileage of low-type bituminous pavements to reseal periodically will be interested in a recently developed high capacity self-propelled chip spreader. The machine operates at speeds of up to 15 mph and has achieved a daily output of about 7 miles of two-lane pavement. The spreader unit is designed to produce a tighter, more uniform surface resulting from placing the larger chips first and filling the voids with the finer stones.

The development of a curbing machine has greatly increased the use

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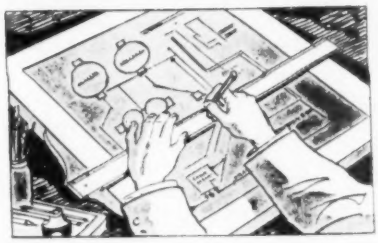

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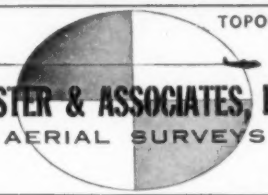

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of asphalt as a curbing material for parking areas, islands, and other high adjuncts.

Construction Methods and Materials

There has been an increase in the use of pneumatic rollers for the consolidation of bituminous concrete pavements during the last several years. Such rollers have been used both for breakdown rolling and for intermediate rolling prior to smoothing with steel wheel rollers. There is some thinking that pneumatic rolling is needed both at the breakdown and intermediate stages with a followup with steel wheel rollers.

Breakdown rolling is accomplished with tire pressures and ballast loads adjusted to produce an average tire contact pressure of 35 to 40 psi. Due to the contour of the tire under these conditions, horizontal forces are exerted which helps to produce better particle distribution. For breakdown rolling with pneumatic-tired rollers, provisions must be made for cooling the tires and scraping off any pickup.

Intermediate or semifinal rolling is normally performed with the tire pressure and load adjusted to produce a contact pressure of 80 to 90 psi. The objective here is to build a density into the pavement that is often not obtained until the pavement has been subjected to heavy traffic. Densification under traffic is often accompanied with some distortion (wheel ruts) to the finished pavement section.

The military has already developed a method of changing tire pressures of vehicles in motion, to provide traction under various support conditions. It has been suggested that a similar arrangement could be made in designing pneumatic rollers so that the same machine could be used both for breakdown and intermediate rolling with a minimum of conversion time.

The Ohio Department of Highways experimented with a heavy duty pneumatic roller in rolling bituminous concrete binder courses. They obtained an average of 101.65 percent of design density with a pneumatic roller having 13.00 x 24 tires inflated to 90 psi (average tire contact pressure of about 77 psi).

The Development Division of the Bureau of Public Roads is working with both the tire and equipment manufacturers in developing criteria which will be indicative of the compacting ability of pneumatic-tired rollers. This involves not only "average contact pressure" for the rated wheel loads but also the allowable

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wheel loads and inflation pressures.

Many bituminous technicians now prefer the use of pneumatic-tired rollers for keying in stone chip seals on surface treatments. By employing pneumatic tires at the lower ranges of contact pressures, it is possible to get good stone imbedment without crushing the particles. A two-axle roller, with the rear axle tracking approximately midway between the tires of the front axle is preferable because streaking is eliminated.

With regard to resealing low and medium type pavements which carry considerable volumes of traffic, there seems to be a trend away from liquid seals toward mixed-in-place seals. Both Virginia and West Virginia have reconditioned many of their older pavements with an inch or more of mixed-in-place materials laid down with a travel plant. Leveling of the more serious cross-sectional deformities is usually accomplished prior to application of a wearing course. Connecticut is using a blade mixed seal of about 30 psy. Both of these methods are aimed at an improved skid resistant riding surface and additional structural stability.

There seems to be an increased use of asphalt emulsion in sealing both Portland cement concrete and bituminous pavements on highways and airports. The use of the slurry seal usually precedes the placing of a bituminous lift or surface treatment. The Department of Public Works of Rochester, New York, has used an asphalt slurry composed of sand (95 to 100 percent passing a No. 10 sieve), crushed stone screenings (90 to 100 percent passing a ⅛-inch sieve), and emulsified asphalt (modification of AASHO SS-1) not only to seal old cracked pavements and to provide a smoother wearing course, but also to seal new-type plant mixes following the final rolling. The slurry was mixed in a batch plant and placed with a spreader box having the interior lined with rubber flaps and equipped with an adjustable screen. Prior to placing the slurry on old streets, a thorough flushing was given with the cracks cleaned out with water and then compressed air. The street was then broomed if necessary and another flushing given several hours before the seal was placed in thickness of about ⅛ in. The city found that after several years of use these methods resulted in a substantial reduction in maintenance costs, especially during winter and the spring breakup.

Another process recently introduced, is the impact method of mixing bituminous materials. The prin-

cipal variations from our conventional plant mixing are the introduction of bitumen into the pugmill in the form of a vapor under pressures of 250 to 300 psi, and high speed mixing which provides a tossing rather than a kneading action. With the aggregate tossed up into the concentrated bituminous fog, individual paricles are instantaneously and uniformly coated.

A bituminous equipment manufacturer has experimented with several of these impact mixing pugmills in combination with other conventional equipment, and results to date have been very encouraging. In Flushing, N.Y., binder courses, fine bituminous concrete and sheet asphalt were mixed in such a modified plant. The coarser mixes coated in much less mixing time, and the sheet asphalt appeared more uniform.

Another field in which considerable progress has been made in the last several years is in the development of skid resistant pavements. The Virginia Department of Highways in seeking a substitute for rock asphalt in deslicking pavements, has developed a silica-sand asphalt mix which is slightly more effective than the natural material and more economical. One of their problems has been the utilization of their plentiful supply of dolomite limestone which tends to polish under traffic.

The fine sand deslicking mix is composed of sand that will pass a No. 10 sieve with 95 percent silica particles. The binder is 85 to 100 penetration asphalt cement to which hydrated lime is added in the mix. The hot mix is applied with a chip spreader or paver-finisher at a rate of from 15 to 25 psy.

Virginia also plans to build in skid resistance during construction, particularly on the Interstate System where the use of polish-resistant materials are required. They plan to use aggregates composed of 50 percent silica sand and 50 percent stone screenings with a top size of $\frac{3}{8}$-in. The mix would be applied immediately after the binder course is applied at the rate of 60 psy.

The New York Port Authority also found that the fine silica-sand asphalt was ideal for resurfacing bridges, because a thin skid-resistant wearing course would not add appreciably to the dead weight and it would not be necessary to raise manholes, curb drains and expansion joints. It is estimated that a saving of about $180,000 was made in using ½-in. silica-sand mix on the Goethals Bridge instead of 3 inches of asphaltic concrete.

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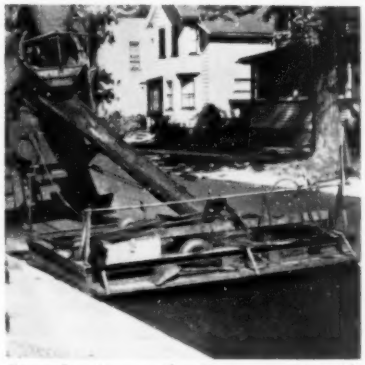
PUBLIC WORKS
EQUIPMENT NEWS

Slurry-Seal Spreader

The new Tarco Slurry-Seal spreader is a low-sided, rectangular, sled-type spreader specially developed for the correct application of slurry seal—a transit mixed blend of emulsified asphalt, sand and water. The slurry is dumped into the spreader and the unit is pulled along by the mixing vehicle. The crack sealing depression-filling, slurry is squeegeed, or wiped, onto the pavement by a heavy neoprene rubber blade, leaving a 9½-ft. wide section of smooth, skid-resistant surface. The 10-ft. long ½-in. thick, neoprene rubber strike off blade is adjustable to the pavement contour by means of 5 screw-type rods. Two retractable pneumatic tired wheels permit easy mobility. For additional information write to the Tarrant Mfg. Co., 28 Jumel Place, Saratoga Springs, N.Y., or circle **No. 6-2** on the reply card.

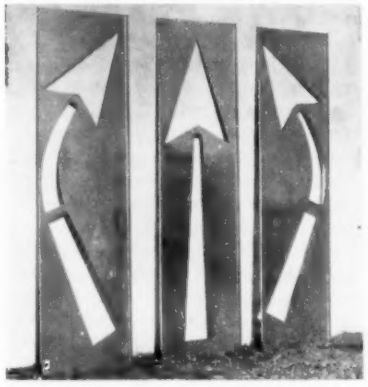


Spreader is completely equipped with a water sprinkling system and tow bar

Metal Offset Masters

Metal offset masters can now be prepared by xerography, Haloid XeroX Inc. has announced. Metal offset masters prepared by xerography offer many advantages: Low cost; lengthy reproduction runs; long plate life; high quality of reproduction; no darkroom; no liquids; and no film intermediate. Field tests with unsensitized aluminum offset masters indicate runs of 100,000 and more. Runoff copies are clean and sharp, and the masters may be easily stored or filed or re-used. Costs average 50¢ per finished master, including labor. For further details write Haloid XeroX Inc., Rochester 3, N.Y. or circle **No. 6-1** on the reply card.

Masters may be easily stored for re-use



Aluminum Stencils For Highway Traffic Marking

Lightweight easy to handle aluminum stencils are available from Sargent-Sowell, Inc. A 1-in. flange on both sides of the stencil provides rigidity. They may be used individually or in groups and the complete alphabet and numbers 1-2-3-4-5-6 and 0 are available. The stencils come in 8, 6, 3, and 2-ft. sizes. Also available are right, left and straight arrows for directional signing of traffic. For further details write Sargent-Sowell, Inc., P. O. Box 868, Grand Prairie, Tex., or circle **No. 6-3** on the reply card.

Rails Make Low-Cost Right-Of-Way Markers

Lightweight railroad rails make ideal right-of-way markers and they are inexpensive, permanent and can be driven easily by hand. The markers are placed every 400 feet on the straightaway (and closer together on the curves), a surveying party first tapping in wooden stakes. Following closely behind, a second crew hammers the markers next to the stakes. The rails are driven about four feet into the ground, and the protruding piece is dabbed with yellow paint so that it can be seen easily. They are made of a 16-pound rail and are 54 ins. long. For more information write L. B. Foster Co., P. O. Box 1647, Pittsburgh 30, Pa., or circle **No. 6-4** on the reply card.

Tilt-Bed Trailer For Tractor-Mounted Equipment

A six-ton tilt-bed trailer designed to haul industrial tractors, tractor loaders, tractor-mounted loaders, backhoes and other light and medium industrial equipment is announced by Spencer-Safford Loadcraft. The 12° tilt of the 79½-in. x 16-ft. platform of the trailer makes it easy to drive equipment onto the bed, which pivots and self-locks into a level transport position. The double-pivot rocker beam tandem assembly with individual suspension on each side of the trailer eliminates springs and axles and permits maximum under-bed clearance. It also gives a smooth ride, and keeps the load level over rough terrain. For further details write Spencer-Safford Loadcraft, Inc., Augusta, Kans., or circle **No. 6-5** on the reply card.

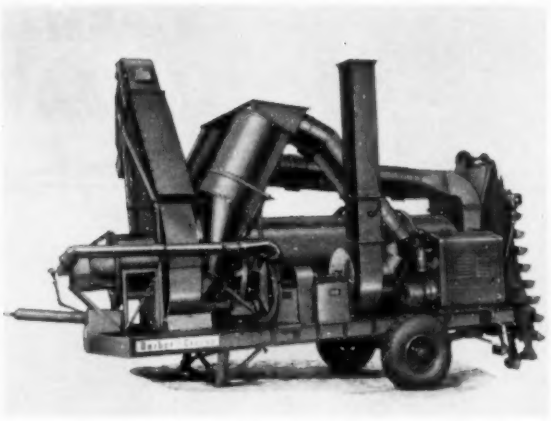
Trailer for hauling highway equipment

Backhoe For Speed Swing Loader

Pettibone Mulliken loader is fitted with many attachments

The availability of an 8-ft. backhoe attachment with two bucket capacities for use with the Speed Swing loader is announced by Pettibone Mulliken. The 18-in. bucket has a $\frac{3}{8}$-yd. capacity; the 24-in. bucket has $\frac{1}{2}$-yd. capacity. It digs to a depth of $8\frac{1}{2}$ ft. and the surface reach is $12\frac{1}{2}$ ft. from front of tires. The loading height, from tires, is 11 ft. and it has a 180° boom swing —90° right and left. Further information from Pettibone Mulliken Corp., 4700 W. Division St., Chicago 51, Ill., or circle **No. 6-7** on the reply card.

Barber-Greene Portable Dryer



Aggregate dryer comes in the 40 to 55 tph capacity range

Barber-Greene has announced the recent addition of their Model 832 aggregate dryer to their asphalt plant and component line. A rubber tire mounted, portable unit, the Model 832 is in the 40 to 55 tph capacity range and is adaptable to either Barber-Greene's continuous-mix or batch plants of appropriate capacity, or to similarly rated plants of virtually any other make. A 79-hp gasoline engine is furnished as standard equipment with either a 75-hp diesel or 50-hp electric power unit available as an optional. Complete information from Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill., or circle **No. 6-9** on the reply card.

Plastic Highway Markers

Traf-Mark plastic highway cones, designed to provide safety for maintenance crews, to protect newly painted traffic stripes and to mark airport runways and temporary traffic lanes, have been introduced by United Plastics & Development Co. Molded from Pliovic polyvinyl chloride resins produced by the Chemical Division of The Goodyear Tire & Rubber Co., the hollow cones are not affected by grease, tar or dirt and can be cleaned easily with solvents or detergents. They are lightweight, have no sharp edges and can be stacked for convenient storage. Base of each cone consists of a strong, reinforced platform which helps keep the cone upright despite accidental bumping. Tops of the cones are designed to accept an adapter for holding flags, signals or blinker lights. The cones are marketed in three sizes—14 ins., $20\frac{1}{2}$ ins. and 28 ins. in height. For further details write to United Plastics & Development Co., Kent, Ohio, or circle **No. 6-6** on the reply card.

Flygt Submersible Contractors Pumps

Flygt submersible electric pumps are pumping units that are manufactured in Sweden and distributed in the United States by Stanco Mfg. and Sales. The pumps operate completely submerged in water and will pump water laden with mud and with a high amount of solids. The smaller B-38L weighs only 70 pounds, allowing it to be easily carried by one man. This unit can push from 25 gpm at 60-ft. head to 55 gpm at 20-ft. head. The B-80L can be transported and positioned by two men, and, with its 6 hp motor has a pumping range of from 110 gpm at 90 feet to 275 gpm at 20 feet. The pumps operate by being placed into the deepest section of the sump; water enters through the bottom, and the units pump out all the water to the last inch. Operating unattended, the pumps require no priming and run dry without damage. For more details write Stanco Mfg. & Sales, Inc., 1666 Ninth St. (Corner of Olympic & Ninth), Santa Monica, Calif., or circle **No. 6-8** on the reply card.

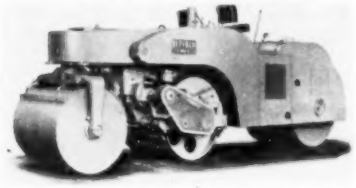
Electric pumps will operate submerged in water and can be handled by two men

Economical Diazo Machine For Engineers And Draftsmen

A new line rotary diazo machine has been announced by Blue-Ray. The new machines, which make blue and black line prints from translucent originals, will particularly benefit engineers and draftsmen. They may be used for reproducing drawings, tracings, specs, charts, maps and construction manuals. The machine eliminates the tie-up of original material; saves printing costs (less than $1\frac{1}{2}$¢ per square foot for materials); saves time and money spent in pick up and delivery to commercial blueprinting or central reproduction departments. The equipment has been engineered for simplicity of operation and requires no special training to operate. With a simple current inverter, it can be operated from a 12-volt vehicle battery for use in the field. More details from Blu-Ray, 301 Main St., Ivoryton, Conn., or circle **No. 6-10** on the reply card today.

3-Axle Tandem Vibratory

A new 3-axle tandem roller featuring an exclusive principle in vibratory compaction has been announced by Buffalo-Springfield. Named the Buffalo-Springfield Model KX-25EV vibratory roller, the new machine has an independent power unit mounted between the end guide roll and the central guide roll. The unit transmits power through V-belts to an eccentric axle shaft supported by extra heavy bearings and running through the center of the middle guide roll. This shaft turns at high speed, creating the vibrating action. Mounted on the eccentric shaft is a second set of bearings supporting the roll itself which allows the roll to revolve freely regardless of roller travel speed or vibrations per minute. The vibrating unit is controlled from the operator's seat. Vibrations per minute are regulated through the throttle and governor control cable



3-axle tandem roller has an exclusive principle in its vibratory compaction

from this position. The power unit for the vibrating roll is a heavy duty gasoline engine rated 75 hp at 2200 rpm and 69.5 hp at 2000 rpm. Normal operating speed is 2000 to 2200 rpm, which provides corresponding vibrations per minute of 2000 to 2200. When vibratory compaction is not desired, the independent power unit is not operated, and the roller becomes basically similar to the regular 3-axle tandem roller. More details from Buffalo-Springfield Roller Co., Div. of Koehring Co., Springfield, Ohio, or circle **No. 6-11** on the reply card.

Automatic Drilling Machine For Water Pipe

An automatic drilling machine for making cuts from 2 through 12 ins. in any type of pipe has been announced by the Mueller Co. The drilling machine, known as the CL-12, is intended primarily as a water distribution cutting machine. The unit features direct-reading tool position and feed travel indicators and automatic disengagement of the tool feed. The automatic tool position indicator works full time, showing the position of the pilot

Mueller drilling machine is a useful water distribution system cutting tool

drill and shell cutter in relation to their fully-retracted position. As the cut progresses, the tool position indicator adds—always showing the total distance the tools have traveled. The feed travel indicator is easily set for the amount of travel required for a desired cut. As the cut progresses, the feed travel indicator subtracts showing the amount of cut or travel remaining in automatic feed. When the pre-set feed travel in automatic feed is reached, the feed is automatically disengaged and the machine idles. Both indicators use large numerals which read directly in inches and tenths of an inch. The CL-12 may be operated by hand with a ratchet handle or power driven with the Mueller H-601 air motor or Mueller H-602 gasoline engine drive unit. No changes in the machine are required to use either hand or power operation. Additional information is available by writing Mueller Co., 512 W. Cerro Gordo St., Decatur, Ill., or circle **No. 6-12** on the reply card.

Bituminous Distributor

A bituminous distributor which is available side mounted, rear mounted, and in semi-trailer forms with a capacity of 1000 to 1430 gallons has been announced by City Tank Corp. The most important feature is the ability of the unit to provide full-on starts and a clean cut off. The full-on starts are provided by the 24-ft. Cartwright hot spray bar. To overcome the problems involved in a bar of this length which requires more circulating capacity than can be provided by a standard 2-in. feed line, the Cartwright bar is fed at 12 points. This design forces circulation through the full length of the bar resulting in positive pressure at the nozzles and assuring full-on starts. And, similarly, shut-off is made at the nozzle, eliminating dripping and providing a clean, straight-cut-off. Full details from Paul Miller, City Tank Corp., 53-09 97th Place, Corona 58, N.Y., or circle **No. 6-13** on the reply card.

Twin-Bucket Aerial Elbow

The double-armed, twin-bucket aerial elbow has unique direct-acting, aircraft-type controls that provide for easier operation and a minimum of maintenance. In addition to eliminating hose and tubing, the Holan control system does away with oil leakage and bleeding of lines to eliminate sponginess. Three levers are located on the support shaft of the righthand bucket and do not interfere with arm movements. A set of levers is also mounted on the mast for emergency control. The elbow has a maximum ground-to-floor height of 36 ft., 10 ins. It reaches 31 ft., 4 ins. horizontally, and will bend 8 ft., 8 ins. below ground level. The upper arm travels 270°, the lower arm, 80°. The mast rotates 360 degrees continuously in either direction. Work buckets—22 by 38 inches deep—are made of non-conductive fiber-glass-reinforced plastic. Capacity of the elbow is 600 pounds. It is designed for street light maintenance, tree trimming and general overhead inspection, construction and maintenance. Complete information from J. H. Holan Corp., 4100 West 150th Street, Cleveland 35, Ohio, or circle **No. 6-14** on the reply card.

Municipal Street Sign Co. has street name signs of several types and sizes

Street and Traffic Signs

Porcelain street signs, held and protected in extruded aluminum frames, are available from Municipal Street Sign Co. The sign plates for these signs can be furnished with either flat or 4-in. embossed letters. Also made are signs with porcelain sign plates and baked enamel plates, both without frames and assembled with supporting fixtures and separator clips. Traffic signs are furnished on either steel or aluminum with silk screened or embossed lettering, plain or reflectorized. For more details write Municipal Street Sign Co., Inc., 777 Meeker Ave., Brooklyn, N. Y., or circle **No. 6-15.**

Highway Turf Mower

No cuttings, rocks or trash are thrown out to the sides with the new Mott Hammer Knife mower made by LeHara Corp. It is available in 4 and 6-ft. widths and the knives are flexibly mounted and retract when hard objects are encountered. Styles available are walk-behind, underslung mounted, rear mounted and trail behind. Units are ideal for mowing along highways, airports and playgrounds. For full data write LeHara Corp., 60 E. 42nd St., New York 17, N. Y., or circle **No. 6-16** on the reply card.

Apparatus For Determination Of Soil Load-Settlement Data

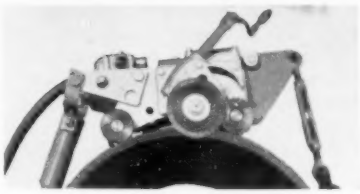
A new and compact soils load settlement device called the Levermatic Consolidation Apparatus has been announced by Soiltest. Consolidation tests are performed in the laboratory to determine a soils load settlement characteristics with time. The data obtained from tests on a small sample in the laboratory can be used to predict the settlement of a foundation under a building, dam, bridge or similar structure. Successful consolidation testing requires a stable loading mechanism capable of applying loads for long time durations and maintenance of the load as the sample consolidates. Model C-220 satisfies both of these requirements. In addition, the lever system is carefully counter-balanced so that no load is applied to the soil specimen due to the unloaded lever system. The unit is entirely self-contained and since there are no electrical or air connections needed, it can be used anywhere with a maximum of convenience. The apparatus measures 13 ins. wide by 23 ins. long by 24 ins. high. For full details write Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill., or circle **No. 6-17** on the reply card.

Roper Highway Auger Digger

Roper highway digger and Chevrolet 4-wheel drive truck make a perfect team

The adaptation of the Roper highway digger to Chevrolet four wheel drive trucks has been announced. The truck need only to be equipped with a rear power take off for the digger is complete with a power plant and universal attaching kit. The digger digs to a 48-in. depth which is required for the setting of guard rail posts by most states and is available with augers up to 14-in. in diameter. For more complete information contact Roper Mfg. Co., 7th & Elm Sts., Zanesville, Ohio, or circle **No. 6-18** on the reply card.

Automatic Pipe Saw



Fein automatic pipe saw can cut pipe from six to sixty inches in diameter

The Fein portable automatic pipe saw cuts 6 to 60-in. pipe and can operate in or out of the trench. It is capable of cutting 1-in. of pipe diameter per minute and requires only 12-in. clearance. The saw can be set up in 5 to 10 minutes and will operate effectively under water. For full details write Prescott Tool Co., Inc., Box 7, Greendale Branch, Worcester 6, Mass., or circle **No. 6-19** on the reply card.

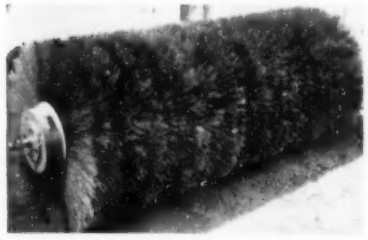
Combination Melter-Applicator

The Model BMA-40 combination melter-applicator offers a practical, safe and economical method of melting and applying rubberized joint sealer by using only one piece of equipment. The machine is a mobile, high performance melter combined with an applicator nozzle attached to a flexible hose that can be reeled in and stored in a heated compartment. The melted material is pumped under pressure to the joint, and the entire pump, piping, hose and nozzle are heated by a simple, convenient arrangement that utilizes the waste heat from the burner. A bottle gas burner with thermostatic control assures proper temperature without overheating and the low silhouette melting chamber makes for ease of charging. The Melter combines very high melting rate with low volume of material and the easy to read, dial thermometers give continuous indication of both oil and material temperatures. Additional information from Berry Corp., Stone Road, Lexington, Ky., or circle **No. 6-20** on the reply card.

Hydraulic Lifter Speeds Up Sludge Removal In Water Plants

An overload control for slurry clarifiers is now available from Graver Water Conditioning Co. It is used with the Graver Reactivator, a water clarification and softening unit. The overload control is a hydraulic lifter on the sludge scraper shaft of the Reactivator which goes into action when heavy sludge prevents normal rotation of the scrapers. The lifter raises the scrapers to as high as 12 inches or more—depending on the volume of sludge—so they can remove the top layer of sludge and work down until the entire bottom area has been cleared and the scrapers can operate smoothly in their normal position. A hydraulic pump and valve system activates the hydraulic lifter. The pump can be operated either manually or by a motor. For further information write to R. S. Lewis, Advertising Manager, Graver Water Conditioning Co., 216 West 14th St., New York 11, N.Y., or circle **No. 6-21** on the reply card.

Street Sweeping Brushes



Brushes are used on road construction

The new Danline street sweeping brush, announced by The Newark Brush Co., features three basic components: a permanent central steel core, reusable metal spacers, and circular wire brush sections. A brush is assembled by simply sliding alternate brush sections and spacers onto the core. Two men can assemble a new brush in 20 minutes or less. The only equipment required is a $\frac{3}{4}$-in. wrench. Brush sections are usually filled with a special round steel brush wire 0.0275-in. diameter. Because of the relatively small wire size, there are more sweeping ends and hence a more uniform fill. The brushes are available for all models of street sweepers, towed sweepers, tractor mounted or end loader sweepers. Brush diameters range from 26 to 36-ins. and are available in lengths up to 10 ft. For more details write Newark Brush Co., 257 Michigan Ave., Kenilworth, N. J., or circle **No. 6-22** on the reply card.

Fiberglass Sign Structure

Fiberglass highway structure is used to suspend directional signs on spans

A new type of highway structure made of fiberglass has been announced by Gar Wood. Designed to suspend highway directional signs on overhead spans the units are available in widths from 40 to 80 feet in 5-ft. increments. They will withstand windloads in excess of 120 mph, and the lightweight structures make heavy erection equipment unnecessary. In appearance, the structures are bright and silvery, resembling a shiny metal; however, any color is available. The coloring is the result of the fiberglass tubing being impregnated with a special coloring agent at the time of manufacture. Since the color goes all the way through the material, it never requires painting. More details from Gar Wood Industries, Inc., Fiberglass Div., Ypsilanti, Mich., or circle **No. 6-23** on the reply card.

Compactor Wheels Extend Work Range Of Tractor Dozers

Clark Equipment now offers open-face steel compactor wheels as standard attachments for the "Michigan" Model 180 tractor dozer. The quick-change attachments replace the rubber-tired wheels; no other modification is necessary. With the dozer blade ahead of the compactor wheels, the "Michigan" can spread material as it compacts—eliminating one dozer on the fill. The 60-in. diameter wheels are 22 ins. wide on the front axle and 26 ins. wide on the rear. They develop 810 lbs. of compression per in. of roll face. With fenders, the machine weighs 36,000 lbs. The compactor wheels usually develop at least 95 percent Proctor in two passes when working in earth suitable for road construction. Best speed for optimum compaction is between 3 and 4 mph—although the compactor can run at speeds up to 10 mph. For further information write to Construction Machinery Div., Clark Equipment Co., P. O. Box 599, Benton Harbor, Mich., or circle **No. 6-24** on the reply card.

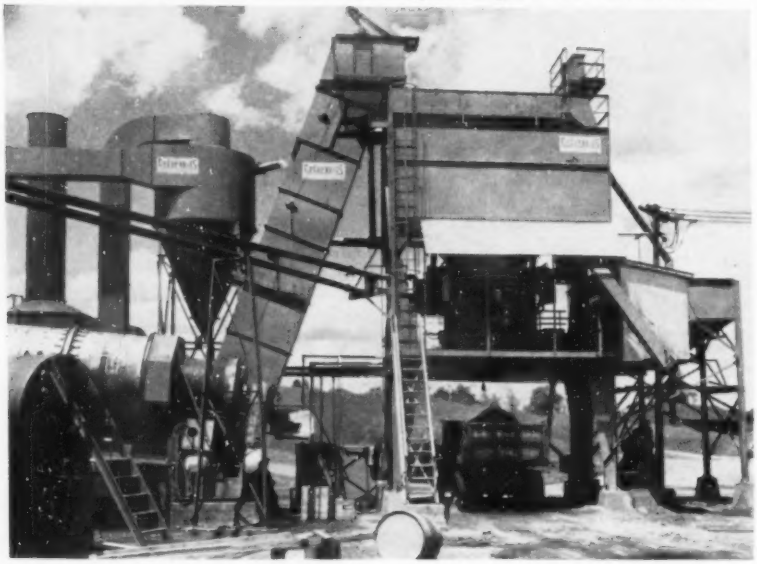
Compactor has 4-wheel drive, power-shift transmission, torque converter

Modern Design for a Waste Receptacle

Receptacle has no bottom to rust from sitting on the ground or in wet places

A new and completely different type of waste receptacle has just been introduced by Vega Industries. This modern receptacle is designed for attachment to any post or wall with height determined by the needs of each application. Securely fastened in a stationary position, a San-Equip waste receptacle is free from vandalism or damage through rough handling, and cannot be blown away or knocked down. Maintenance costs are minimized, too. A damp cloth is all that is needed to keep the receptacle's baked enamel finish new looking for years. They are ideal for use in streets and parks and public buildings. For more data write Vega Industries, Inc., Syracuse 5, N.Y., or circle **No. 6-25** on the reply card.

Cedarapids Stationary Asphalt Plants

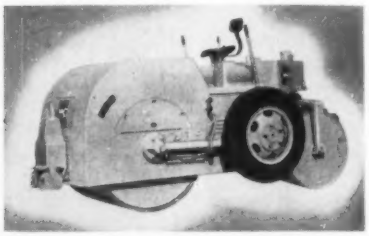


Model H60A mixing plant is in sectionalized units that can be easily transported

A complete new line of batch-type bituminous mixing plants, designated as the Model H Series, has been introduced by Iowa Mfg. Available in six sizes, covering capacity ranges from 45 to over 240 tons per hour, the new Cedarapids Model H plants are designed without running gear or self-erecting equipment. The line of batch-type plants is said to be complete in meeting the output needs of large and small producers. Weighing and mixing processes on the units can be arranged for four different types of operation: Manual control; semi-automatic control; fully-automatic control; and automatic with remote control. Complete specifications and further information are available from Iowa Mfg. Co., Cedar Rapids, Iowa, or circle **No. 6-26.**

Huber-Warco Adds 4-6 Ton Tandem Roller

A 4-6 ton retractable wheel roller has been added to Huber-Warco's tandem line. This unit offers the distinct advantage of maximum portability. In three simple steps it is easy to convert the roller from working to transport position for fast movement from job to job. The retractable wheels and towing hitch are operating by a power hydraulic system. This unit has the exclusive feature of a tail-shaft governor, combined with a torque converter and water-cooled engine. Because of the balanced weight design, there are only 1,280 pounds riding on the towing vehicle. From 17 to 21 percent less weight on the hitch results in better towing action at higher speeds. Hydraulic controls are located on the side of the machine—there's no need to climb on the deck. Because of the extreme portability of this 4-6 ton tandem roller, more efficient paving and patching operations can be completed by townships, cities, counties and state highway departments. More details from Huber-Warco Co., Marion, O., or circle **No. 6-27** on the reply card.



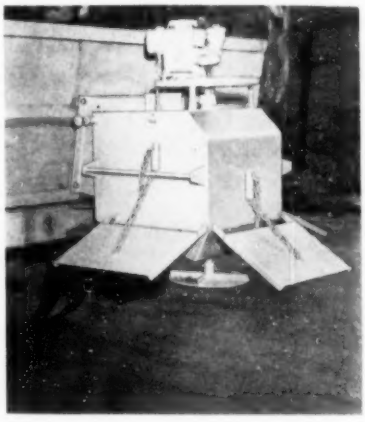
Roller permits effective patching and paving operations by road departments

Trench Filler and Shoulder Spreader

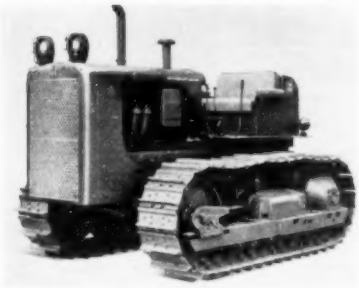
A new machine, designed specifically for the filling of road widening trenches and spreading of shoulder material, has been developed by Ulrich Mfg. Co. The Model T40 unit is an attachment for Caterpillar motor graders, and can be attached or detached in less than 10 minutes, with just three bolts and one pin making the connection. The unit is equipped with an angling strike-off blade which can be adjusted to spread from one to ten feet wide. Minor width variations of from one to 24 ins. are made by simply rotating the grader circle. Width changes greater than two feet are accomplished by removing or adding one-foot blade sections. Spreading depth is independently power controlled on both ends of the strike-off. The pavement end is raised or lowered with a double acting hydraulic cylinder and, the outer end, with the grader blade lift mechanism. The strike-off blade can be set at any point 16 ins. below or 8 ins. above the pavement. As trucks dump their loads, the dump apron can be raised or lowered hydraulically to match the height of the truck. Power for the belt is furnished through a hydraulic motor and gear reduction unit. The hydraulic system which operates the belt, the dump apron and the strike-off blade is powered by a 50-hp gasoline engine. Complete specifications and additional information from Ulrich Mfg. Co., Roanoke, Ill., or circle **No. 6-28** on the reply card.

Cinder and Salt Spreader

A new centrifugal cinder and salt spreader for highway use has been announced by Voich Brothers. This belt driven unit has no gears or sprockets and is powered by a four-cycle Briggs and Stratton gasoline engine. Installation is quickly done by attaching the spreader to the truck tailgate with 4 bolts. Cinders or salt are fed from the truck body through a door in the tailgate into the spreader. From here the material is evenly spread by the spinning action of the distributing disc. Adjustable deflectors and the speed of the distributing disc control the area of spread. The unit weighs 180 lbs. and measures 28 ins. x 27 ins. x 40 ins. For more details write Voich Bros., Irwin, Pa., or circle **No. 6-29.**



International Introduces New TD-20 Diesel Crawler Tractor



The 134 hp diesel crawler tractor designated as the TD-20 is announced by IHC. The TD-20 has a six-speed full reverse transmission. A separate lever operates the forward-reverse "shuttle bar" control which provides six speed ranges forward and six in reverse. Drawbar hp on this model is rated at 111 with a maximum drawbar pull of 27,500 lbs. in first gear at 1.5 mph. The 74-in. gauge tractor has an operating weight of 29,300 lbs. Using a D-691 diesel engine rated at 134 net engine hp at 1550 rpm, the unit can operate up to a maximum 45° angle with positive lubrication to all engine working parts. Engine horsepower is transmitted to the tractor gear train by a field-proved, dry-type clutch with sintered metal facing. For full details write Consumer Relations Dept., International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill., or circle **No. 6-30.**

Rotagrator Screen and Comminutor

An improved Rotagrator screen and comminutor incorporating many new and advanced features for the comminution of sewage solids is announced by Infilco Inc. The comminuting principle employed avoids the disadvantages of requiring fully adjusted cutting edges and of providing the high horsepower required by the hammer-mill types of equipment. Three safety features enable the Rotagrator to operate continuously without harm to the mechanism regardless of the load. These include special design, material and operation of the comminuting rollers; adjustable friction clutch that slips under excess loads; and an overcurrent relay which reverses the machine in the case of particularly heavy loads. The unit is offered in five sizes for channels from 2 ft. to 6 ft. in width. Complete information from Infilco Inc., P. O. Box 5033, Tucson, Ariz., or by circling **No. 6-31** on the reply card.

NEWS OF ENGINEERS

HAROLD D. BRILEY of Briley, Wild & Associates, Consulting Engineers of Daytona Beach, Fla., is now president of the Florida Engineering Society.

A. F. BENSCHEIDT, a retired Commander of the Navy Civil Engineer Corps, is now associated with GEORGE F. NICHOLSON, consulting engineer of Long Beach, Calif., specializing in harbor and waterfront engineering and construction.

KENNETH E. SHULL has been elected Vice President in charge of public relations and water quality control of the Philadelphia Suburban Water Co. BENJAMIN G. MITCHELL has been made Vice President and General Superintendent. HAROLD S. SCHUTT is President of the Company.

JOHN R. SNELL of Michigan Associates, consulting engineers of Lansing, Mich., has been elected president of the Consulting Engineers' Association of Michigan which represents 55 consulting engineers in Michigan. Recently the CEAC voted to join the Consulting Engineers' Council, a national organization.

SOL KING, long time employee of Albert Kahn Associates, Detroit, has been elected to the presidency of that organization succeeding GEORGE H. MIEHLS, who becomes Chairman of the Board and Treasurer.

WILLIAM L. HAVENS, well known in sanitary engineering and senior partner of Havens and Emerson of Cleveland and New York, died on April 26, following a sudden illness.

W. F. SMITH, consulting engineer-rancher of Howe and Wise in Houston, can now claim authorship among his achievements. Doubleday and Co. has published his "Diamond Six," the story behind the ranch founded in 1844 by his grandfather. As a Texas Ranger, who was also a merchant, sheriff, and gunfighter, Smith's ancestor provided the personality as well as the locale for the book. The occasion resulted in the sponsorship of a Texas-style party at Conroe on June 7 to give Smith's many friends an opportunity to honor him and help him celebrate the publication of "Diamond Six."

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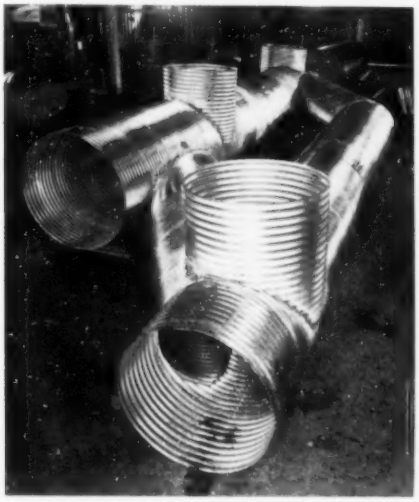
—Worth Seeing

Powered by a Boeing high speed gas turbine, this experimental Allis-Chalmers crawler is put through its paces on the proving ground. Gas turbine design gives the equivalent of a "built-in" torque converter, with a net horsepower which is said to about equal that of its diesel powered HD-21 counterpart.



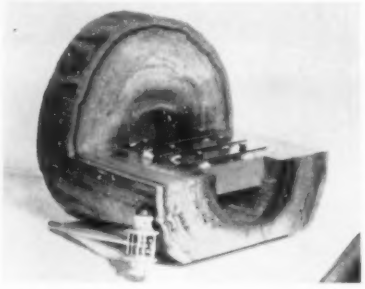
Clever is the best description for this complicated junction chamber and overflow for a large sewer job at Madison Heights, Michigan. James A. Salle, Detroit, designed it of various diameters of Armco metal pipe. Structure was spray coated before shipment.

We like to hear of big orders in the hard goods field. Here T. S. Peterson and W. O. Lampl of Quick-Way Truck Shovel Co., Denver, sign $12 million order for 400 units for delivery to the U. S. Army Corps of Engineers. Shipment rate will be 20 per month.

Ten Miles of tractor shovels is a lot of "Payloaders," but that's the caravan put on the road by the Frank G. Hough Co. from its plant in Libertyville, Illinois. Only part can be pictured here. Final destination of "Payload Caravan West" is a meeting of 200 distributors in Salt Lake City, Utah.

by Arthur K. Akers

★ RICHARD V. FORD and George Kelsey thought up this one: call chimes made from an ancient wooden water pipe laid in Philadelphia in the early 1800's. It was



presented, with a gavel made from the same chestnut wood, to the AWWA at the April meeting in Dallas by Harry E. Schlenz, president Pacific Flush Tank Co. And as "Lonesome George" says, "they don't hardly ever make wood pipe any more."

★ MORTON SALT CO. has an impressive and impressive-looking new address, now at 110 North Wacker Drive, Chicago.

★ CATERPILLAR TRACTOR CO. acquires new honors: this time the Navy's Certificate of Merit for development and manufacture of tractors in the Antarctic Operation DEEP FREEZE I.

★ RECORDAK CORPORATION invited a thousand industrial representatives to see a demonstration in Cleveland of microfilmed engineering drawings that save millions of dollars annually.

★ THE FOXBORO CO. has a new New York sales manager, John E. Hewson.

★ ASPLUNDH CHIPPER CO., Jenkintown, Pa., becomes national distributor for Emhart Manufacturing Co., Skyworker Division, Milford, Conn. This is in addition to Asplundh's regular line of brush chippers and saws.

★ RAYMOND E. LAPLANTE has been made manager of West Coast Sales for Brown Co., Boston, including Bermico sewer pipe. He succeeds Earl Van Pool, who will continue to serve Brown's customers on a part-time basis and in a consulting capacity to LaPlante.

★ TEXAS VITRIFIED PIPE CO., Mineral Wells, has launched a large remodeling and construction program that will include manufacture of clay pipe up to five feet in length and 36″ in diameter. Output is to be improved rather than increased.

★ C. E. PONKEY of Dallas began his new duties May 1 as executive vice president, Layne & Bowler, Inc., Memphis, "world's largest water developers."

★ AD AWARD being presented to Massey-Ferguson Industrial Divi-

sion, Wichita, Kans. Left, Preston D. Huston, president Associated Advertising Agency, Wichita; right, C. J. Davis, general manager of M-F.

★ "QUITE IMPRESSIVE, well-conducted, brief, to the point, and well done," were the considered comments of our representatives at the dedication of the Strickland Research Laboratory of the National Clay Pipe Manufacturers Association in Crystal Lake, Ill., April 15. Supporting photos and data indicate this was an understatement.

★ "I SEE you're letting your little son drive the car."
"Yes, he's still too young to be trusted as a pedestrian."

first New Highway-Act pavement...

POZZOLITH* employed in concrete

Placing the *first concrete pavement* in the 41,000-mile Interstate Highway System to be constructed under the Federal-Aid Highway Act of 1956: A 4-mile stretch of 24-foot concrete pavement on U.S. Route 40 west of Topeka, Kansas. Kansas State Highway Commission. Contractor: Koss Construction Co., Kansas Division. Pozzolith employed in concrete.

to better control:

1. *Water content* . . . makes possible lowest water content for a given workability.
2. *Rate of hardening* . . . provides desired time for handling, placing and finishing under widely varying job conditions.
3. *Entrained air* . . . provides optimum air content without sacrificing strength or other desired qualities.

This combination of controls obtained with Pozzolith provides, most economically, the properties desired in both plastic and hardened concrete.

Any one of our more than 100 seasoned fieldmen will be glad to demonstrate the full benefits of Pozzolith for your project, and to advise of the availability of Pozzolith Ready-Mixed Concrete through more than 1000 qualified producers.

*POZZOLITH . . . Master Builders trademark for its water-reducing, air-entraining admixture for concrete. Since 1932 employed in over 150,000,000 cubic yards of concrete for projects of every type.

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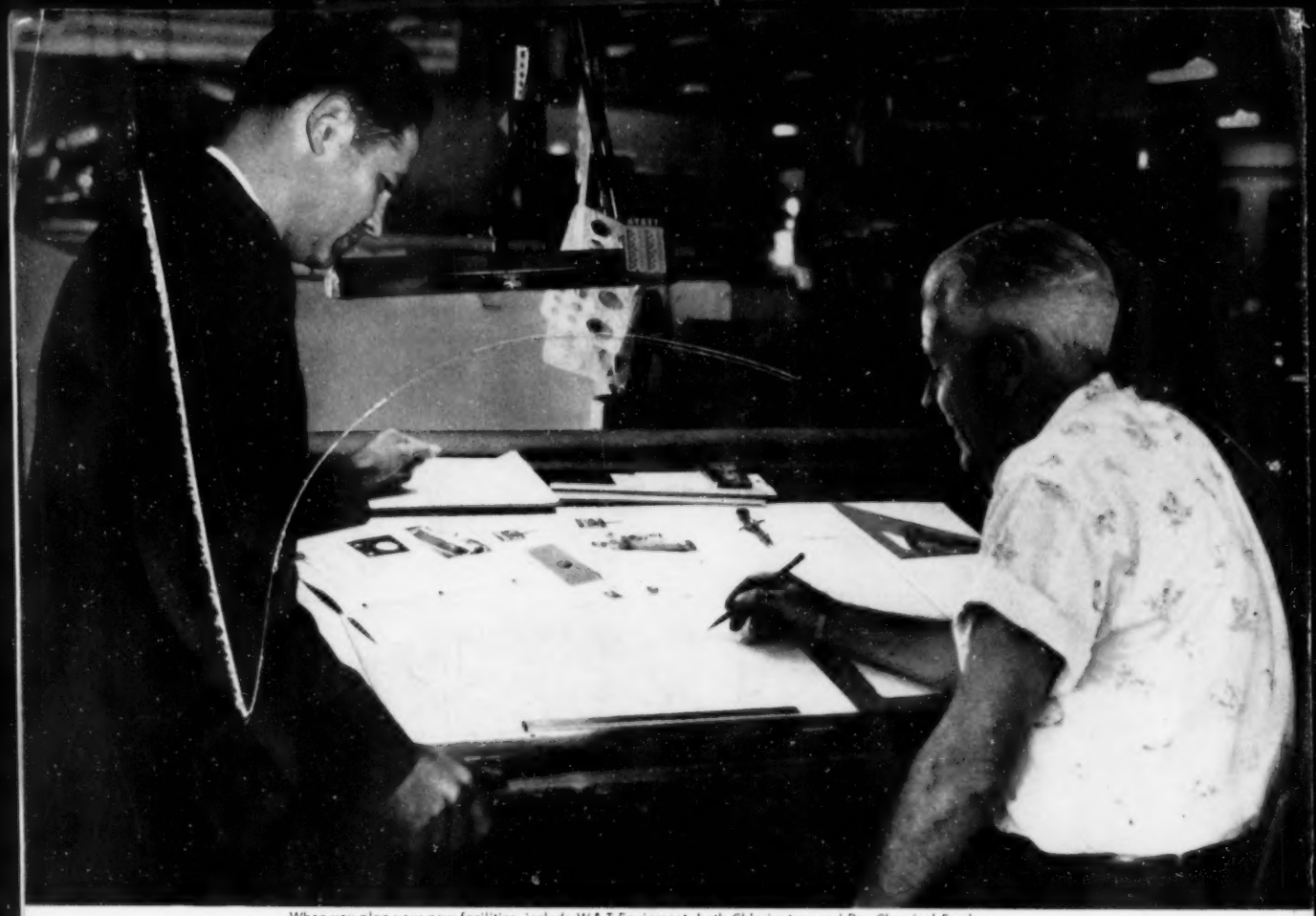

When you plan your new facilities, include W & T Equipment, both Chlorinators and Dry Chemical Feeders.

". . . this is where we plan to put the W & T Dry Chemical Feeders."

When you plan your new plant or the expansion of your present one, be sure to plan a place for W&T Dry Chemical Feeders as well as Chlorinators. W&T Feeders are used for every type of dry feeding problem found in water and sewage treatment plants.

W&T makes both volumetric (volume measurement) and gravimetric (weight measurement) feeders. There is a feeder for any size job, from small equipment to measure out ounces, to accurate giants capable of handling thousands of pounds per minute.

To find out more about W&T Dry Chemical Feeders, write for bulletin S-120. Or let us know the type of feeder problem you have, so we may send publications describing the W&T equipment best suited for your job.

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